## The clerkship as a learning environment

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# THE CLERKSHIP AS A LEARNING ENVIRONMENT

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# THE CLERKSHIP AS A LEARNING ENVIRONMENT

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# CHAPTER 1

## INTRODUCTION AND OUTLINE OF THIS THESIS

Undergraduate medical students, undertaking their clinical clerkships, spend considerable time in different clinical settings. During clinical clerkships students are exposed to a wide variety of learning experiences so that they can master complex clinical skills. Historically, learning in the clinical setting took the form of an apprenticeship. Each day the apprentice accompanied the personal mentor to acquire the knowledge and clinical skills needed to perform history taking, physical examination and therapeutic interventions. After observing and imitating the mentor for a certain period of time the apprentice eventually graduated and became a medical doctor. The quality of student learning was entirely dependent on the quality of the mentor as a role model, however limited this might be in some cases.[1] Today, individual guidance of one undergraduate student by one expert is neither desirable nor feasible. Society needs large numbers of medical doctors. The government makes urgent appeals to medical schools to increase enrolment of students in their curricula. In due course this will result in an increase in the number of medical students entering clinical clerkships. For reasons of efficiency it is desirable to maximise the percentage of students graduating from medical school after a fixed period. Papa et al. described five major curricular reform movements which have catalysed significant changes in medical education since 1765: the apprenticeship model (1765-), the discipline-based model (1871-), the organ-based model (1951-), the problem-based-learning model (1971-) and the clinical presentation model (1991-).[1] These changes were prompted by increasing interest in, attention for and understanding of the knowledge-based structures and cognitive processes that characterise and distinguish between medical experts and novices.[2,3] Expertise is not so much a matter of superior reasoning skills or in-depth knowledge of pathophysiological states as it is a matter of cognitive structures in which the features of prototypical or individual patients are stored. These cognitive structures contain relatively little explicit knowledge about pathophysiological causes of symptoms and complaints, but they do contain a wealth of clinically relevant information about disease, its consequences and the conditions in which illness develops. Despite the far-reaching curricular modifications that resulted from the aforementioned five curricular reform models, form and content of clinical clerkships have remained relatively unchanged.

To be able to offer students efficient and effective clerkship experiences, it is important to know what happens in the learning environment of clerkship rotations. Many experts are involved in the training of medical students in various clinical clerkships. In general, the educational quality of individual clerkships is highly variable.[4] One of the factors that influence the effectiveness of the learning environment of clerkships is the variety in clinical teachers' educational expertise.[5] Previous studies have shown that clerkship learning experiences differ not only between hospitals and hospital departments but also, and even more so, between individual students.[6,7] Some students see more patients and practise more skills than their colleagues. It is not fully understood what causes the differences between hospitals and individual medical students and what measures might be taken to enhance the effectiveness of

clerkship learning. From an educational perspective, clerkships can be characterised as 'black boxes': we do not know what learning experiences students encounter and what elements of the training programme do or do not contribute to the acquisition of complex skills.[5]

In order to bring more structure to clerkship learning experiences, several medical schools have defined the learning objectives to be met by graduating medical students. However, the inevitable discrepancies between the intended and the learned curriculum should temper overly high expectations of the effects of the introduction of learning objectives.[8] Log books in which students are expected to document relevant learning experiences can be helpful in monitoring whether the intended learning objectives are being met. It has been shown, however, that students cannot always be relied on to record all their experiences in the log books.[9] Log books can be useful as a self evaluation instrument. However, for log books to be really effective, they must be integrated into the supervision process.[9-11] Log books should be used by both students and their supervisors to evaluate the progress of students' clinical competence over the course of clerkship rotations. Various clinical supervision activities can be distinguished.[12] The core ingredient of clinical supervision is feedback. Feedback must be instructive, informative and to the point. When afforded in a professional manner, feedback can provide a significant stimulus to the learning process.[11,13] Such feedback hinges on observation of students' performance. Unfortunately, direct observation has been shown to be the exception rather than the rule in clinical clerkships.[14,15] Apart from being able to provide feedback in a professional manner, an excellent supervisor should have other educational skills as well. The variety of clinical teachers' educational expertise influences the effectiveness of clerkships as a learning environment.[5] Characteristics of excellent clinical teachers have been described in several studies.[16-23] The good clinical teacher possesses excellent clinical competencies, skills, enthusiasm, educational knowledge and skills relevant to clerkship learning. In addition, he or she should be able to enlist students active involvement in the learning process, promote students' autonomy and be a good communicator. Nowadays, students encounter many different teachers in a variety of settings, including wards, outpatient clinics, the bedside, in the community, et cetera. Previous studies have shown that, in the opinion of medical students, the teachers they interact with most frequently during clinical clerkships are junior doctors and residents.[20,24,25] The majority of these teachers have not had any professional training for the teaching role.[23] Their main task is to provide patient care and they have very little time left to supervise and teach students. The already limited teaching time is in danger of yet further reduction due to pressure on clinical teachers to raise clinical productivity and increase the number of papers published in high-impact journals.

The purpose of the study reported in this thesis was to unravel several educational elements of the 'black box' called clinical clerkship and thereby learn which educational factors might enhance the effectiveness of undergraduate medical students' learning on clinical rotations. As described above, many variables determine the educational effectiveness of clinical clerkships. These variables seem to be related to characteristics of both the clinical learning environment

and the clinical educators. This thesis focuses on the question which variables, related to aspects of the clinical learning environment and clinical staff, impact on the effectiveness of clerkship learning and how these variables can be influenced so as to enhance the effectiveness of clerkship learning for medical students. In order to investigate these issues, the following research questions are addressed in this thesis:

1. How can a traditional clerkship be described as a learning enviroment?
2. How can the learning effectiveness of a clinical clerkship be improved by:
   a. interventions in the learning environment itself?
   b. interventions in staff-educators?

***Research questions***

**Chapter 2** addresses research question 1 and describes a study, performed in a traditional surgical clerkship in an academic hospital in which no structured teaching activities were offered. In order to shed light on parts of the contents of the 'black box' of this traditional clerkship, answers were sought to the following questions: 1) to what extent do students meet formulated objectives in relation to patient problems and clinical skills? 2) what is the nature of the feedback students receive from clinical staff during this clerkship 3) how do students spend their time on clerkship rotations?

**Chapter 3** describes a study in which research question 2.a was addressed. In this study student evaluations of a traditional surgical clerkship were compared with those of a restructured surgical clerkship at the same location. In the restructured clerkship several interventions were introduced at once. This was inspired by research into the effectiveness of Continuing Medical Education, which showed that multifaceted approaches were most effective.[26] The interventions were: the introduction of a logbook supplemented by pre-coded checklists for obligatory structured assessments, direct observation and structured feedback. The study focused in particular on the influence of the log book on the content of the clerkship, the amount and nature of feedback and students' activities.

**Chapter 4** addresses research question 2.a. It describes undergraduate medical students' perceptions regarding effective clinical learning experiences. Focus group interviews were conducted with participants who had done either the traditional surgical clerkship or the restructured one. The focus group interviews focused on two questions: 1) which learning experiences contributed to students' learning during the surgical clerkship? 2) what do the students who did the clerkship with structured teaching and those who did the traditional

clerkship think about the structured clerkship components, recently introduced in the academic hospital?

**Chapter 5** focuses on question 2.b. Good clinical teaching requires sufficient time for planning, teaching and reflection on the teaching process.[27] To make sure that good clinical teaching is offered by all those involved in clinical education during clerkships, it is important to have insight into the teachers' teaching effectiveness. In order to measure teaching quality at the level of a group of teachers and at the level of individual teachers a reliable and validated instrument should be available. Outcomes obtained with such an instrument can be used to give feedback to teachers and for remediation purposes. Chapter 5 describes the Clinical Teaching Effectiveness Instrument, a discipline-independent instrument for rating individual staff members' teaching quality. This instrument was developed by Copeland and Hewson and has been used in postgraduate training programmes in the United States of America.[28] Firstly, the instrument was translated into Dutch and used in an undergraduate clerkship in order to examine its reliability in appraising individual teachers, both staff members and residents. Secondly, the reliability of the instrument as a tool to measure teaching quality of a group of staff members and residents was investigated.

**Chapter 6** addresses research question 2.b. and describes a study in which the question was answered whether a two day educational training programme improved the effectiveness of teaching by residents/ junior doctors in an undergraduate surgical clerkship. As quantitative outcome measure individual scores on the Clinical Teaching Effectiveness Instrument, a validated instrument, were collected, using a pre-test, post-test, control study design. Qualitative data were collected, using semi-structured interviews with teachers who participated in the educational training programme.

Chapters 2 through 6 present published journal papers. This means that some repetition of content was inevitable.

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# CHAPTER 2

# HOW EFFECTIVE IS A CLERKSHIP AS A LEARNING ENVIRONMENT?

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# *Chapter 2*

***Summary***

In order to assess the educational quality of a traditional clerkship, a questionnaire was administered to 28 students at the end of their ten-week surgical clerkship. The questionnaire contained 116 items on learning objectives, patient problems encountered by students, clinical skills performed, feedback received and amounts of time spent on various activities. The students indicated that they had adequate ability to correctly analyse and manage patient problems. However, the standard deviations and ranges show that individual students' exposure to various patient problems was insufficient. Students generally saw too few emergency patients. The frequencies of performance of diagnostic and therapeutic skills varied widely among students. Most of the feedback received by students was given by residents rather than faculty physicians. Students spent considerable time on activities of limited educational value. It appears that learning during a clerkship occurs rather haphazardly. There are indications that the "educational exposure" varies substantially from student to student.

Apprenticeship learning is a common characteristic of training programmes for complex professional skills, with the apprentice receiving intensive practical training under the guidance of expert professionals. For optimal effectiveness, the apprenticeship should offer students the opportunity to learn in situations that resemble their future professional setting as closely as possible.[1]

Undergraduate medical students spend considerable time in clinical rotations in hospital departments where they are expected to master the basic clinical skills. Traditionally, clerkships expose students to a wide variety of learning experiences, with basic clinical skills acquisition occurring in a rather haphazard fashion. In order to bring more structure to the clerkship learning experience, several medical schools have defined learning objectives that are to be met by students when they have finished undergraduate medical education. Even though these medical schools have defined their intended curriculum, the extent to which this matches the actual curriculum remains unclear, as was shown by Remmen et al.[2]

Apart from quantitative learning aspects, the quality of training determines the educational effectiveness of clerkship rotations. During clinical rotations many different teachers play a part in students learning processes. Jolly reported that the educational expertise of clinical teachers influences the effectiveness of a clerkship as a learning environment.[3] Feedback afforded in a professional manner, which requires the educational expertise of clinical teachers, is known to provide a significant stimulus to the process of learning.[4] As many different teachers are involved in students' learning processes, the quality and intensity of feedback is likely to vary across different hospital departments.

From an educational perspective, clinical rotations can be characterised as a "black box": we do not know which learning experiences a student encounters and which elements of the training programme do or do not contribute to their acquisition of complex skills.[3] Systematic assessment of students' performance is rare during clinical rotations. Moreover, if students are evaluated, the focus is, more often than not, on factual knowledge. In order to investigate some elements of the "black box" of a traditional surgical clerkship in an academic hospital, we used a questionnaire which sought students' experiences and opinions in relation to a number of dimensions considered relevant for the clerkship as a learning environment. Our research questions were:

1. To what extent do students meet formulated objectives related to patient problems and clinical skills (what is the "actual" curriculum)?

2. What is the nature of the feedback students receive from clinical staff during their clerkship?

3. How do students spend their time during their clerkship?

***Methods***

The study was carried out at the Department of Surgery of the University Hospital of the Vrije Universiteit, Amsterdam, the Netherlands. After finishing four years of pre-clinical medical education, Dutch medical students enter 84 weeks of clinical rotations in all the major clinical disciplines.

In 1999, the medical school used a consensus procedure to define the educational objectives of clerkship in terms of patient problems and clinical skills to be encountered by students. These objectives are based on the blueprint in which the objectives for all medical schools in the Netherlands are defined.[5] How these objectives are to be attained is not prescribed. Each clinical department is responsible for teaching the objectives pertaining to their discipline, preferably by offering students real patient contacts.

*Subjects*

All students who completed their ten-week surgical clerkship during the period from July 1998 through December 1998 were asked to complete a questionnaire on the last day of their clerkship. Content and form of the surgical clerkship can be described as rather traditional. Apart from small group teaching sessions twice a week, no structured training is offered to students. Students rotate through different surgical departments during a ten week period: four weeks on the inpatient ward of the department of general surgery, one week on the orthopaedic ward and outpatient clinic, one week on the urology ward and outpatient clinic, two weeks in the emergency room of the hospital and two weeks in the general surgical outpatient clinic.

*The instrument*

The questionnaire consisted of 116 items covering five potential dimensions considered relevant to the educational quality of clerkships. The dimensions consist of aspects related to: learning objectives, patient problems encountered by students, clinical skills carried out, feedback received and time spent on various activities.

1. Learning objectives (2 items)

This dimension asked students whether the learning objectives of the surgical clerkship were clear to them at the start of the clerkship and whether they thought these were easy to attain. Students were asked to give their opinion on a five-point Likert scale (1 = not at all, 2 = moderate, 3 = sufficient, 4 = amply sufficient, 5 = good).

2. Patient problems (30 items)

The second dimension concerned the objectives related to the 30 surgical patient problems on the list of educational objectives. The 30 patient problems were divided into six clusters: general surgical patient problems, gastro-enteric problems, vascular problems, emergency

problems, urological problems and orthopaedic problems. Students were asked to rate their ability to analyse and correctly manage each patient problem on a five-point Likert scale. (1= inadequate, 2 = moderate, 3 = sufficient, 4 = amply sufficient, 5 = good).

3. Clinical skills (23 items)
The third dimension evaluated how frequently students actually performed various clinical skills. The clinical skills were divided into two main groups: diagnostic skills and therapeutic skills. A six-point scale was used: 1 = never performed, 2 = 1 to 2 times, 3 = 3 to 4 times, 4 = 5-6 times, 5= 7-8 times, 6 = >8 times.

4. Feedback (49 items)
The fourth dimension reflected the quality and quantity of feedback on several activities which students received from members of the surgical staff, including residents. Feedback was defined as the information teachers gave to students about their performance of a specific skill for the purpose of helping students achieve a higher level of performance. Firstly, we asked students by whom they were supervised most of the time (>50% of the time spent on feedback was provided by a resident or by a surgeon). Secondly, we asked the students if supervision entailed observation when they were taking a history, performing a physical examination or performing other clinical skills. Thirdly, we asked the students if they had received feedback on clinical activities. A five-point Likert scale was used: 1 = never, 2 = seldom, 3 = regularly, 4 = almost always, 5 = always. Fourthly, we asked the students to give their opinion in response to three statements concerning quality aspects of the feedback received. Students could indicate their response to the statements on a five-point scale: 1= fully disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = fully agree.

5. Time allocation (12 items)
The fifth dimension pertained to how students spent their time during the clerkship. In our opinion, the ten weeks of the surgical clerkship are rather short to meet all the formulated objectives. This means that it is important that students' time is spent on activities that make the clerkship as effective, instructive and informative as possible. Students were asked to indicate on a four point scale how many hours per week they had spent on various activities: 1 = <1 hour, 2 = 1-2 hours, 3 = 2-3 hours, 4 = >3 hours.

***Data analysis***
Means, standard deviations, ranges, and frequencies were calculated for each of the questionnaire items.

***Results***

Out of 34 questionnaires 28 were returned and could be fully analysed (response rate: 82 %).

Learning objectives

Only 8% of the students stated that the objectives of the surgical clerkship were not clear to them on entering the clerkship and 4% of the students considered the objectives difficult to attain or unattainable.

Patient problems

Table 1 shows how students rated their ability to analyse and correctly manage the different clusters of patient problems. Although students reported that on average their ability was "sufficient" for all six clusters, standard deviations were relatively large and ranges varied widely. The percentages of students who rated their ability as "inadequate" or "moderate" varied from 1.8 % to 23.2 %, with percentages for patient problems related to emergency, urology and orthopaedics being twice as high as those for the other clusters. Because the standard deviations and ranges suggest that individual students see different patient problems, we analysed the number of different patient problems each individual student encountered. On average, students rated their ability to analyse and correctly manage a patient problem as "sufficient", "amply sufficient" or "good" for 26 out of 30 patient problems (range 15-30 patient problems).

**Table 1.** Self-reported ability to analyse and manage different clusters of patient problems. (1 = inadequate, 2 = moderate, 3 = sufficient, 4 = amply sufficient, 5 = good)

| **Cluster of patient problems** (number of problems) | **Mean** | **Standard deviation** | **Range** | **Percentage inadequate/moderate** |
|---|---|---|---|---|
| General surgery problems (7) | 4.09 | 0.85 | 1-5 | 5.1 |
| Gastro-digestive problems (4) | 4.12 | 0.72 | 1-5 | 1.8 |
| Vascular problems (3) | 3.94 | 0.86 | 2-5 | 7.1 |
| Emergency related problems (4) | 3.22 | 1.01 | 1-5 | 23.2 |
| Urological problems (4) | 3.58 | 0.99 | 1-5 | 14.3 |
| Orthopaedic problems (8) | 3.58 | 1.13 | 1-5 | 21.4 |

Clinical skills

Table 2 shows the results concerning the frequency of performing diagnostic and therapeutic skills. While nearly all students examined the locomotor system at least three times, three quarters of the students reported performing the diagnostic skill "examination of arteries and veins" only once or twice and nearly one third of the students performed a physical examination of a patient with a hernia less than three times. Of the therapeutic skills only

the skill "setting and removing sutures" was performed more than three times by three quarters of the students. As for the performance of all other therapeutic skills, at least half of the students reported performing these skills rather infrequently (0-2 times). The very large standard deviations and ranges suggest that individual students performed different diagnostic and therapeutic skills and that some skills were hardly performed at all by some of the students. When we calculated the average number of different diagnostic and therapeutic skills an individual student performed at least three times during the clerkship, it appeared that students did, indeed, differ considerably in the different diagnostic and therapeutic skills they encountered. The average number of skills performed more than three times by a student was low (11 skills out of 23 skills; range 7-15).

**Table 2.** The frequency of performing various diagnostic and therapeutic skills.
(1 = never, 2 = 1-2 times, 3 = 3-4 times, 4 = 5-6 times, 5 = 7-8 times,6 = > 8 times)

| **Diagnostic skills** | **Mean** | **Standard deviation** | **Range** | **Percentage 0-2 times** |
|---|---|---|---|---|
| Examination of locomotor system | 4.79 | 1.33 | 1-6 | 5.7 |
| Examination of arteries and veins | 2.10 | 1.38 | 1-6 | 73.6 |
| Examination of hernia | 3.96 | 1.75 | 1-6 | 29.8 |
| **Therapeutic skills** | | | | |
| Providing anaesthesia | 2.65 | 1.58 | 1-6 | 51.8 |
| Wound care including burns | 2.50 | 1.96 | 1-6 | 60.2 |
| Setting and removing sutures | 3.54 | 1.44 | 1-6 | 24.6 |
| Applying dressings and bandages | 1.41 | 0.73 | 1-5 | 94.7 |
| Bladder catheterisation | 1.73 | 1.02 | 1-6 | 82.5 |

Feedback

Only for the rotation in the outpatient clinic of the department of general surgery did 60% of the students report being supervised most frequently by one of the surgeons. During all other rotations supervision was mostly provided by residents. Actual observation during medical history taking was a rare occurrence. 89% of the students answered that they were "never" or "seldom" observed while taking a patient's medical history. Students were also hardly ever observed performing a physical examination: 75% of the students reported being "never" or "seldom" observed while performing a physical examination. Therapeutic skills were observed more frequently, with only 25% of the students reporting being "never" or "seldom" observed. Table 3 presents the results for clinical activities on which students had received feedback. Some striking differences across activities are found.

More than 60 % of the students answered that they had "almost always" or "always" received feedback about their case presentations and their performance of therapeutic skills, whereas up to 25 % of the students answered that they "almost always" or "always" received feedback on history taking, physical examination and record keeping.

**Table 3.** Self-reported frequency of feedback received by students on various clinical skills.

| Clinical activity | Never (%) | Seldom (%) | Regularly (%) | Almost always (%) | Always (%) |
|---|---|---|---|---|---|
| History taking | 10.7 | 35.7 | 39.3 | 14.3 | 0.0 |
| Physical examination | 7.1 | 28.6 | 42.9 | 21.4 | 0.0 |
| Record keeping | 3.6 | 14.3 | 57.1 | 17.9 | 7.1 |
| Case presentation | 0.0 | 14.3 | 25.0 | 46.4 | 14.3 |
| Therapeutic skills | 3.6 | 17.9 | 17.9 | 46.4 | 14.3 |

Finally, we asked the students about quality aspects of the feedback received during the five different rotations in the surgery clerkship. Most of the students (range 68%-89%) agreed or fully agreed with the statement: the feedback you received was informative, instructive and to the point. At least 50 % of the students agreed or fully agreed with the statement that they had received feedback on various clinical activities on a daily basis, with the exception of the urology rotation for which only 43 % of the students agreed or fully agreed. The percentages of students who agreed/ fully agreed with the statement: feedback you received was mostly (>50%) provided by a member of the clinical staff (surgeon, urologist or orthopaedic surgeon) showed striking differences between the five rotations. Only for the rotation in the outward clinic of general surgery did more than half of the students agree or fully agree with this statement. For all other rotations, students reported that feedback was primarily provided by residents.

Time allocation

Table 4 shows the number of hours spent on various activities.

All students reported that they had spent three or more hours per week on the intake of newly admitted patients and assisting in the operation theatre. Time spent on overall individual feedback was reported by all students as being limited to less than one hour per week. Almost 80% of the students reported spending three or more hours per week on activities of limited learning value, such as collecting blood samples, searching for X-rays, et cetera.

**Table 4.** Time allocation of students during their surgery clerkship. Percentages of students who spent ≥1 hour, ≥2 hours or ≥3 hours on various activities.

| | Number of hours per week | | |
|---|---|---|---|
| **Activity** | **≥ 1 hour** | **≥ 2 hour** | **≥ 3 hour** |
| Small group meetings | 96 | 57 | 25 |
| Clinical ward rounds | 86 | 61 | 25 |
| Assisting in the operation theatre | 96 | 93 | 86 |
| Intake of new patients (history taking, physical examination, medical record) | 100 | 100 | 100 |
| Feedback on intake of new patients | 75 | 18 | 4 |
| Presentation of patient case | 96 | 50 | 29 |
| Observing diagnostic/ therapeutic skills | 64 | 36 | 21 |
| Performing diagnostic/ therapeutic skills | 36 | 18 | 4 |
| Waiting time | 57 | 50 | 36 |
| Self study | 82 | 61 | 39 |
| Activities of limited learning value (e.g. collecting blood samples, searching for X-rays) | 100 | 96 | 79 |
| Overall individual feedback | 0 | 0 | 0 |

***Discussion***

The data of this study are based on the students' self assessment of their ability to deal with clinical situations. It is known that individual students' self assessment does not always correspond with their ability as measured by objective assessment. However, Gordon proved that self assessment is a reliable method in groups of students.[6] Although the number of questionnaires, analysed in this study is rather low, previous generalisability studies have shown that a minimum of ten questionnaires is sufficient to allow reliable inferences to be drawn and to attain acceptable reproducibility in studies evaluating quality aspects of clinical teaching.[7] Frequency and time estimates may, however, have been biased due to the small sample size. Although, in general, students reported having "sufficient" ability to correctly analyse and manage patient problems for all six clusters of problems, standard deviations and ranges show that exposure to the different patient problems varied among students. This is in accordance with another study by Gruppen et al., which also reported gaps in the exposure of individual students to certain patient problems.[8]

In this study exposure of all students to three out of six clusters of patient problems appeared to be insufficient. This means that there is a serious gap between the intended curriculum and the actual curriculum. In the categories of problems related to emergency, urology and orthopaedics the percentages of problems for which students indicated inadequate/moderate

perceived competence were at least twice as high as those for the other categories. A possible explanation may be that not all students can be present when an emergency patient is admitted. Given that students spend only one week in the orthopaedics and urology rotations, it seems reasonable to assume that there simply is not enough time for students to have the number of patient contacts needed to meet the learning objectives related to these specialities. This suggests that other teaching methods should be considered or that rotation time should be extended. The latter option, however, would not seem to be effective, since it will also increase the number of activities of limited educational value.

It is not clear how often a student needs to see a particular problem or perform a skill to achieve an adequate level of competence. In our study we considered an arbitrary frequency of three times or more as adequate for the clinical skills. The results regarding the frequencies of performing diagnostic and therapeutic skills demonstrated a similar wide variation among individual students as was seen for patient problems. Only three out of eight groups of skills were performed three times or more by the students and a substantial number of skills were never performed by a sizeable proportion of the students. More than fifty percent of the students reported never having performed the examination of arteries and veins. For three out of five groups of therapeutic skills more than 50% of the students reported that they had never performed these skills at all.

Diagnostic skills competence is essential for all graduating medical students. Many clinical teachers assume that students acquire adequate competence in these skills during their clinical rotations. The results of our study did not support this assumption. This indicates that it would be advisable to pay more attention to the performance of diagnostic skills in a structured way during observations, bedside teaching, grand rounds and small group teaching sessions. The low frequency of therapeutic skills performance by the students can be explained by the fact that most of the therapeutic skills are routinely performed by nurses. This raises the question whether it is really necessary for students to learn these skills. The answer is that these skills are included in the objectives of the clerkship and that in settings where no nurses are available, for instance in general practice, doctors do have to perform these skills. Consequently, it is necessary that more opportunities for practising these skills should be created for students. At present the role of nurses in clinical skills teaching seems to be underestimated. Nurses can make a significant contribution to medical education by instructing students and evaluating their clinical performance.[9,10] Efforts should be made to improve the collaboration of medical staff and nursing staff in teaching therapeutic skills to medical students.

During their rotations on various wards students were mostly supervised by residents, who also provided most of the feedback.[11] The role of faculty physicians in providing feedback to medical students was limited. Xu et al. suggested that residents' teaching behaviours may

be different from those of faculty physicians.[12] In addition, residents' performance may also be problematic, as was demonstrated in several studies.[11] Although in this study the students were quite satisfied with the quality of the feedback provided by the residents, it appears that residents' feedback is mainly related to activities that benefit their daily work, i.e. presentations and clinical skills performance. Less attention was paid to history taking, physical examination and record keeping. In this study students were seldom observed while taking a medical history or performing a physical examination, even though these skills are considered to be the core learning activities for students during clerkship. Others have also reported a lack of actual observation during clerkships.[13] It would seem that students have to learn their skills by trial and error.[3,14] Efforts should be made to ensure that students are more often observed and given feedback when performing clinical skills. It is of the utmost importance that students receive feedback on various activities. Faculty physicians, residents and other health care professionals, such as nurses, could collaborate to cover the various activities on which a student should receive feedback in order to improve students' clinical skills.

We found that students spent more time observing others performing diagnostic/therapeutic skills than performing these skills themselves. Almost all students reported that they spent more than two hours a week on tasks which we believe have little educational value, such as collecting blood samples, searching for X rays. This finding is rather worrisome, the more so since students also reported spending more than two hours per week just waiting. The total clerkship period of Dutch students covers only 84 weeks and government regulations have restricted students' working hours. Consequently, time should be used as efficiently as possible in order to enable all students to achieve the learning objectives.

Although all students reported that they spent more than two hours per week on the intake of newly admitted patients, only a limited number of students received feedback on this activity for more than two hours. We did not investigate how many patients students encountered weekly. All students reported that weekly less than one hour was spent on overall individual feedback. All time estimates were based on self-reports and this may have introduced some bias. However, self-reported time estimates have been reported to correlate well with registration of actual time allocation.[15]

The results give us some idea of what goes on in the "black box" of the surgical clerkship. Because it is our primary task as teachers to create the best possible learning environment for students, we must use the results of this study as a starting point for optimising our clerkship. Even though the reality of students' clerkship experiences shows that there is nothing to be proud of, we now at least have facts to convince our colleagues that change is needed. This need is even more pressing, when we take into account that the traditional clerkships are the most expensive component of the undergraduate curriculum.[16]

***Conclusion***

The effectiveness of a clerkship as a learning environment depends on many factors. It may be helpful for students to be informed of the learning objectives on their first day of clerkship, but we should bear in mind that individual students' experiences are likely to vary widely and that it is unrealistic to rely exclusively on actual patient encounters to provide students with the competencies required. We found serious gaps between the intended curriculum and the actual curriculum. Skills in dealing with acute patient problems should also be taught in patient independent teaching sessions. It is imperative that students should receive instructive feedback on their clinical activities and that feedback is not given by residents only. The participation of nursing staff in teaching clinical skills to medical students can be valuable and should be considered. Students spend considerable time on activities of limited educational value, they also spend too much time waiting and observing others perform clinical skills. The clerkship would gain in effectiveness if students could use their time as efficiently as possible. Overall, it seems that clerkship learning is an unstructured, rather haphazard process. The "educational exposure" varies substantially from student to student and considerable time is spent on activities with limited learning value. Feedback and supervision, didactic core features of the apprenticeship learning model, are limited and largely left to residents. Exactly how these elements impact on student learning is largely unknown. More research is needed to provide a firm basis for improving the effectiveness of clerkship as a learning environment.

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# CHAPTER 3

## THE IMPACT OF MULTIFACETED EDUCATIONAL STRUCTURING ON LEARNING EFFECTIVENESS IN A SURGICAL CLERKSHIP

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# *Chapter 3*

***Summary***

*Introduction* Various measures have been introduced to enhance learning experiences in clerkships, generally with limited success. This study evaluated the impact of a multifaceted approach on the effectiveness of learning in a surgical clerkship. In accordance with results obtained in Continuing Medical Education, several interventions were introduced simultaneously. We compared students evaluations of the traditional surgical clerkship with those of the restructured one.

*Methods* Two consecutive cohorts of students were asked to complete a questionnaire about the quality and quantity of their learning experiences. Cohort I (n=28) undertook the traditional clerkship and cohort II (n=72) the restructured clerkship. A Mann Whitney Test was used to compare the outcomes of the two cohorts.

*Results* There were few statistically significant differences between cohort I and II. Overall, quality indicators did not differ between the two cohorts.

*Discussion* A short-term multifaceted intervention led to a slight increase in the performance of clinical skills and a slight decrease in time spent on activities of limited educational value. The intervention may have been too brief to produce substantial effects. Future interventions should also target the teachers, including trainees, in order to assess their opinions and address their educational needs.

Undergraduate medical students spend considerable time in different clinical settings where they undertake their clinical clerkships. Clerkships typically expose students to a wide variety of unstructured learning experiences.[1] The effectiveness of such learning experiences is questionable. Given that exposure to core patient problems and clinical skills is by no means certain, the acquisition of competence in managing such problems is equally doubtful.[2] Various educational measures have been introduced to enhance the educational effectiveness of clerkships. One strategy has been to define learning objectives. The idea is that well-defined learning objectives will guide students in seeking out instructive learning experiences, thereby using the brief period of one clerkship as efficiently as possible and thus optimising the effect of the clerkship.[3] Explicit learning objectives can also help teachers to target learners' specific needs.[4] Nonetheless, the well-known discrepancies between the intended and the learned curriculum should temper overly high expectations of the introduction of learning objectives.[5] Another strategy has been the use of log books, in which students are expected to document relevant experiences. It has been shown, however, that students cannot always be relied upon to do so.[6] For log books to be really effective, they must be an integral part of supervision.[6,7] An important ingredient of supervision is feedback. When afforded in a professional manner, feedback can provide a significant stimulus to the learning process.[8,9] Feedback should be instructive, informative, non-threatening and to the point. Such feedback requires observation of students' clinical performance. Sadly, direct observation appears to be the exception rather than the rule during clinical clerkships.[10-13] These strategies, (i.e. the introduction of learning objectives, log books and feedback) are not effective as isolated educational interventions. Research on the effectiveness of Continuing Medical Education (CME) showed that multifaceted approaches were effective.[14] This prompted us to investigate the effectiveness of a multifaceted approach to improving the educational quality of a clerkship. To do so, we simultaneously introduced a log book, direct observation and structured feedback into the surgical clinical clerkship of the VU Medical Centre, Amsterdam, the Netherlands. A separate sample pre-test/post-test design was used to investigate the effects of these measures. We compared student evaluations of the traditional surgical clerkship with those of the restructured clerkship. In particular, we explored the influence of the log book on the content of the clerkship, the amount and nature of feedback and students' activities. We assumed that the restructured clerkship would lead to improvement on all three aspects.

*Methods*

The study was carried out at the Department of Surgery, VU Medical Centre, Amsterdam, the Netherlands. The undergraduate medical curriculum of the VU Medical Centre offers four years of pre-clinical training followed by two years of clinical training, with clerkships in all major clinical disciplines. The surgical clerkship lasts ten weeks: four weeks on the general

surgical wards, one week on the orthopaedic ward and outpatient clinic, one week on the urology ward and outpatient clinic, two weeks in the hospital emergency room and two weeks on the general surgical outpatient clinic. The traditional and the restructured clerkship did not differ in duration and schedule.

*Population*

Between July 1998 and January 1999, 34 students (cohort I) passed the traditional surgical clerkship, which offered no formal training apart from small group teaching sessions twice weekly. Between January 1999 and April 2000, 89 students (cohort II) passed the restructured surgical clerkship. Students and staff were informed verbally and in writing about the changes in the clerkship. Both cohorts of students were surveyed on the last day of the surgical clerkship.

*The restructured clerkship*

The restructuring process attempted to enhance the educational quality of the surgical clerkship by the introduction of a student log, observation of skill performance, supervision and individual staff appraisal.

On their first day in the surgical department students received a student log. This log book described the learning objectives, i.e. precoded patient problems which students should preferably encounter in patient contacts and precoded clinical skills to be performed by the students. The objectives were derived from Blueprint 1994, training of doctors in the Netherlands, which details the common objectives of undergraduate medical education in the Netherlands.[15] Students were asked to record in the log book whether they had been actively or passively involved when encountering a specific patient problem, whether the patient problem was discussed afterwards with a supervisor, and if they had written up the problem for the patient record. Students were expected to carry the pocket format log with them every work day and record their experiences.

Observation of students' clinical skill performance was promoted by the fact that students had to ask their supervisor to initial the log indicating that s/he had observed the student performing the skill in an adequate manner.

In order to ensure the integration of the log book into the supervisory activities of clinical staff, the log was supplemented by precoded checklists for the obligatory structured assessments during the clerkship, which included one observed history, one observed physical examination of a newly admitted patient, write-ups of ten different patient problems, four patient presentations and one oral presentation of a surgical subject based on the recent surgical literature. All checklist items were described in a manual, which was handed out to students and examiners at the start of the clerkship. On each checklist the examiner was invited to offer written comments to stimulate the provision of feedback. The checklists and the manuals were of a convenient, portable format. The student could take out the required

checklist at the time of the assessment.
An individual staff appraisal was scheduled halfway through and at the end of the clerkship. It included discussion of the student's log and the supplements on assessments as well as feedback on the student's strengths and weaknesses. The log and the checklists played an important role in the decision whether a student passed or failed the clerkship. Students were in charge of their own log book. It was only presented to the supervisor at staff appraisals.

*Instrument*
A questionnaire was developed to measure the differences between the traditional and the restructured clerkship. Students were asked to respond to 82 items concerning five dimensions: learning objectives; core patient problems encountered by students; core clinical skills carried out; feedback received, and time spent on various activities as a measure of the efficiency of the clerkship as a learning environment.

1. Learning objectives (2 items)
The intended and the actual content of the clerkship was explored by asking students to indicate on a five-point Likert scale (ranging from 1=not at all to 5=good) whether the learning objectives were clear to them at the start of the clerkship and were easy to attain. We expected the students of cohort II to give more positive answers.

2. Patient problems (30 items)
Using a five-point Likert scale (ranging from 1=inadequate to 5=good) students were asked to rate their ability to analyse and correctly handle 30 core patient problems selected by clinical staff of the surgical department from the list of objectives based on the Dutch national blueprint.[15] For the data analysis, the 30 patient problems were grouped into six clusters: general surgical problems; gastro-digestive problems; vascular problems; emergency related problems; orthopaedic problems, and urology problems. We expected fewer students from cohort II to rate their ability as 1 (inadequate) or 2 (moderate).

3. Clinical skills (24 items)
The 24 skills addressed in these items were selected from the national blueprint by surgical staff. The skills were divided into diagnostic (12 items) and therapeutic (12 items) skills. Students were asked to indicate the frequency of skill performance on a six point scale (1=never, 2=once or twice, 3= three or four times, 4=five or six times, 5=seven or eight times, 6=more than eight times). We expected the students of cohort II to give higher frequency ratings.

4. Feedback (14 items)
Feedback was defined as the information teachers gave to students about their performance, thereby helping them to achieve a higher level of performance. Firstly, students were asked by whom (surgeon or trainee) they were supervised most of the time. Secondly, students were asked to indicate on a five-point Likert scale (ranging from 1=never to 5=always) whether supervision entailed direct observation of history taking, physical examination and other clinical skills. Thirdly, students were asked to indicate on the same five-point scale whether they had received feedback on other clinical activities. Fourthly, students were asked whether the feedback received was informative, instructive and to the point. We expected qualitative and quantitative improvement in the feedback received by students using the log book compared with students on the unstructured clerkship. One of the changes in the restructured clerkship was that clinical staff received written and oral instructions on how to provide supervision with feedback, for example, instructions on the checklists for the structured assessments. The frequency of direct observation was increased by introducing observations of student-patient encounters and clinical skill performance. Therefore, we expected students from cohort II to report more frequent supervision by clinical staff than by trainees, more frequent observation of clinical activities and greater satisfaction with the feedback on clinical activities.

5. Time allocation (12 items)
This dimension probed students' use of time during the clerkship. It is important that students engage in activities that render the clerkship as effective, instructive and informative as possible. Students were asked to indicate on a four-point scale (1=<one hour; 2=one to two hours; 3=two to three hours; 4=>three hours) how much time per week they spent on different activities. The following activities were considered to be of limited educational value: waiting, collecting blood samples, finding X-rays, and observing as opposed to performing clinical skills. Feedback on clerking newly admitted patients, independent study and individual staff appraisals were regarded as contributions to the effectiveness of the clerkship. We expected the students of cohort II to report more time spent on instructive activities.

*Data analysis*
A Mann Whitney Test was used to compare cohort I and cohort II. $P<0.05$ was considered significant. We calculated the following percentages based on the proportions of students who rated the items on clarity and attainability of the learning objectives as amply sufficient/good, students who rated the items on patient problems as insufficient/moderate, students who performed a certain skill twice or less, students who answered they were never/seldom observed or never/seldom received feedback on certain clinical activities. The totals per dimension were calculated whenever appropriate.

*Results*

Participants

Out of 34 students in cohort I, 28 returned the questionnaire (response 82%). On the 89 students in cohort II, 72 returned the questionnaire (response rate 81%). Non-response was due to logistic problems in collecting the questionnaires. Missing values in both cohorts were rare (< 1%).

Learning objectives

In both cohorts, 69% of the students agreed that the objectives were clearly formulated at the start of the clerkship. The percentage of students responding that the objectives were easy to attain was 72% in cohort I and 63% in cohort II. The difference between the cohorts was not statistically significant.

Patient problems

Table 1 shows the percentage of students in the two cohorts rating their ability to correctly analyse and handle a cluster of patient problems as 'moderate' or 'insufficient'. No statistically significant differences were found.

**Table 1.** Self-reported ability to correctly analyse and manage clusters of patient problems.

| | % inadequate/moderate | |
|---|---|---|
| **Cluster of patient problems (no. of problems in cluster)** | **Cohort I (traditional clerkship)** | **Cohort II (restructured clerkship)** |
| General surgical problems (7) | 5 | 3 |
| Gastro-digestive problems (4) | 2 | 3 |
| Vascular problems (3) | 7 | 3 |
| Emergency related problems (4) | 24 | 16 |
| Urological problems (4) | 14 | 11 |
| Orthopaedic problems (8) | 21 | 16 |
| Total of patient problems (30) | 13 | 9 |

Clinical skills

Table 2 shows the percentage of students performing certain diagnostic or therapeutic skills twice or less. No statistically significant differences were found between the cohorts. It was striking that most clinical skills were performed twice or less by at least 50% of the students in cohort I and II, except for examination of the locomotor system (6% and 11%, respectively), examination of hernia inguinalis (30% and 18%, respectively) and setting and removing sutures (25% and 18%, respectively) in cohort I and II, and giving an anaesthetic (47%) in cohort II.

**Table 2.** Percentage of students rating the frequency of performing a clinical skill as ≤ 2.

| **Diagnostic skills (no. of skills)** | **Cohort I (traditional clerkship)** | **Cohort II (restructured clerkship)** |
|---|---|---|
| Examination of locomotor system (5) | 6 | 11 |
| examination of arteries and veins (5) | 83 | 73 |
| Examination of hernia inguinalis (2) | 30 | 18 |
| **Total of diagnostic skills (12)** | **38** | **39** |
| **Therapeutic skills** | | |
| Giving an anaesthetic (2) | 52 | 47 |
| Wound care including burns (4) | 75 | 80 |
| Setting and removing sutures (2) | 25 | 18 |
| Applying dressings and bandages (2) | 95 | 92 |
| Bladder catheterisation (2) | 82 | 88 |
| **Total of therapeutic skills (12)** | **67** | **68** |

**Table 3.** Percentage of students answering they never or seldom received feedback on certain clinical activities.

| **Clinical activity** | **Cohort I (traditional clerkship)** | **Cohort II (restructured clerkship)** |
|---|---|---|
| History taking | 46 | 52 |
| Physical examination | 36 | 44 |
| Medical record keeping | 18 | 25 |
| Presentation of newly admitted patients | 14 | 11 |
| Performing clinical skills | 21 | 19 |

Feedback

Cohort I and II did not differ significantly in answering to the question by whom they were mostly (more than 50 %) supervised. Only in the general surgical outpatient clinic feedback was predominantly provided by clinical staff. (Cohort I: 41%; cohort II: 27 %) During all other rotations more than 70% of students in both cohorts answered that they were mostly supervised by trainees.

A total of 89% of students in both cohorts reported that history taking was seldom or never observed and 75% in cohort I and 79% in cohort II reported the same for the physical examination. The differences between the two cohorts were not statistically significant. Observation of diagnostic and/or therapeutic skill performance was significantly lower in cohort II compared to cohort I ($p < 0.05$), with 51% and 25%, respectively, reporting being never or seldom observed. Table 3 shows the percentages of students who answered that they had never or seldom received feedback on certain clinical activities. The differences between cohort I and II were not statistically significant.

Most of the students in both cohorts (range cohort I: 70-86%; range cohort II: 67-90%) agreed or fully agreed to the statement that the received feedback was instructive, informative and to the point. Differences between cohort I and II were not statistically significant.

Time allocation

Table 4 presents the results on time allocation. Students in cohort II spent significantly less time on activities with a limited learning value compared to students in cohort I. Cohort II students appeared to perform diagnostic/therapeutic skills more often than they observed them. The differences between the two cohorts in this respect were statistically significant. Fewer students of cohort II spent more than 3 hours per week clerking newly admitted patients compared to cohort I.

**Table 4.** Percentages of students by cohort spending ≥ 1 hour, ≥ 2 hours or ≥ 3 hours on various activities. The cohorts are indicated as I (traditional clerkship) and II (restructured clerkship).

| Activity | Number of hours per week | | | | | |
|---|---|---|---|---|---|---|
| | ≥ 1 hour | | ≥ 2 hour | | ≥ 3 hour | |
| | I | II | I | II | I | II |
| Small group meetings | 96 | 96 | 57 | 39 | 25* | 10 |
| Clinical ward rounds | 86 | 82 | 61 | 47 | 25 | 13 |
| Assisting in the operation theatre | 96 | 99 | 93 | 93 | 86 | 79 |
| Intake of new patients | 100 | 97 | 100 | 96 | 100* | 85 |
| Feedback on intake of new patients | 75 | 67 | 18 | 25 | 4 | 6 |
| Presentation of patient case | 96 | 89 | 50 | 60 | 29 | 34 |
| Performing diagnostic/ therapeutic skills | 37* | 73 | 19 | 31 | 4* | 20 |
| Individual staff appraisal | 7 | 17 | 0 | 4 | 0 | 0 |
| Self study | 82 | 76 | 61 | 56 | 39 | 38 |
| Observing diagnostic/ therapeutic skills | 64 | 50 | 36 | 26 | 21 | 10 |
| Activities with limited learning value (e.g. collecting blood samples) | 100 | 94 | 96* | 79 | 79* | 54 |
| Waiting time | 64* | 85 | 50 | 56 | 36 | 36 |

* = statistically significant difference between Cohort I and Cohort II ($p < 0.05$).

*Discussion*

This study investigated the impact of a multifaceted educational intervention on the effectiveness of a surgical clerkship by surveying students on their perceptions of various aspects of the clerkships. We expected to see improved scores on learning objectives, structured learning experiences, direct observation of students' performance, feedback and amount of time spent on valuable learning activities in students who undertook the restructured clerkship. However, statistically significant differences between cohort I and II were only found for direct observation of diagnostic/therapeutic skill performance and time allocation. To our surprise, the percentage of students reporting being seldom or never observed when performing a clinical skill was higher in the restructured clerkship. Why did the multifaceted intervention fail to generate significant improvements? Firstly, there may be an instrumentation problem. Students were asked to rate the educational quality of the previous ten weeks on the final day of the clerkship. Perhaps this is too soon for students to give a well-considered opinion and more time should elapse between the clerkship and the evaluation to allow students to gain a balanced overview of such a lengthy period. Students in cohort I and II undertook the clerkship in different years with different fellow students. In

1999 discussions were initiated on how to improve the clinical clerkships in the VU Medical Centre. Students were invited to participate in these discussions and encouraged to reflect on the quality of clerkships. This may have resulted in the students in cohort II, as a group, being more critical of their own learning than were the students in cohort I.

An other possible explanation for lower self ratings in cohort II may be the fact that students in cohort II answered more negatively to a more detailed analysis of their performance having a more realistic understanding of their abilities as a result of the feedback received. Because the students of cohort II were told on their first day of attendance that they could expect to be observed by clinical staff during diagnostic/therapeutic skill performance, they may have expected more frequent observation than they actually experienced. Their more negative answers concerning the frequency of observed skill performance may have originated in unfulfilled expectations. We found a statistically significant difference between cohort I and cohort II in time spent performing clinical skills and time spent on activities with limited learning value. Students using the log book spent more time performing clinical skills and less time on activities with limited learning value. Apparently, the learning objectives did provide some degree of guidance towards useful learning experiences.

Secondly, the sample size may have hampered the detection of statistical significance. The number of questionnaires analysed was rather low, especially in cohort I. However, previous generalisability studies have shown a minimum of ten questionnaires to be sufficient to allow reliable inferences to be made and to attain acceptable reproducibility in studies evaluating quality aspects of clinical teaching.[16] Although it is known that in individuals self-assessment does not always correspond to objective assessment, it has been shown to be a reliable method in groups.[17] It was not feasible to divide the study population into two groups and offer the restructured clerkship to one group and the traditional clerkship to the other one on the same location during the same period. Students would have met and talked to each other and would not have accepted different curricula.

Another explanation may be that the 'treatment' was too short and too limited in scope to produce major improvements. The students were not familiar with the log book and the structured assessments. Most of the clerkships in the other major clinical disciplines were still traditional with no structured training sessions. The multifaceted approach we used was successful in CME, but CME is a long-term undertaking. It has been aptly labelled as "the fifty years curriculum", encompassing all the learning that occurs from entry into practice until retirement.[14] Introduction of the multifaceted approach into all the major clinical clerkships and sustaining the changes over a longer period might bring more substantial effects.

Finally, the effects of the intervention might have been larger if staff had been more involved in the restructuring. Staff development and staff involvement is considered to be a major prerequisite of a curricular change.[18] Clinical staff and trainees may not have been adequately informed about their changed role in the restructured clerkship. We did not verify whether staff lived up to what was expected of them in this experiment. The changes introduced required more active participation by both students and teachers. For example, students were

supposed to ask for observation on skill performance and teachers were supposed to observe skill performance and provide feedback immediately afterwards. It is important that the working climate for students and teachers alike should be conducive to the necessary active participation. Students should feel free to ask for support and feedback. This means that they must have good self-directed learning skills. Such skills are vital to students' motivation to learn and improve competence.[19] Teachers, on their part, should have sufficient time to attend to the educational needs of their students.

Considering the above-mentioned limitations, we conclude that the introduction of several simultaneous interventions yielded a slight improvement in the educational effectiveness of the surgical clerkship. It is clear that the educational quality of clinical training deserves further study. The results of the present study suggest that short-term restructuring of one clerkship is not sufficient to enhance the effects of clinical training. Fruitful directions for research appear to be teacher development, with special attention for trainees who appear to shoulder most of the responsibility for the training of undergraduate students. Self-directed learning skills should be fostered in students and clinical departments should strive for an inspiring, learner friendly working climate.

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CHAPTER 4

# A QUALITATIVE STUDY OF CONSTRUCTIVE CLINICAL LEARNING EXPERIENCES

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# *Chapter 4*

***Summary***

Little is known about the effectiveness of clinical education. More educational structure is considered to be potentially beneficial. The following structured components were added to a surgical clerkship: log books, observed student-patient encounter, individual appraisals, feedback on patient notes, and (case) presentations by students. Two focus group sessions were organized in which nineteen students participated to explore their perceptions about effective clinical learning experiences and the newly introduced structured components. The analysis of the transcripts showed that observation and constructive feedback are key features of clinical training. The structured activities were appreciated and the results show the direction to be taken for further improvement. Learning experiences depended vastly on individual clinicians' educational qualities. Students experienced being on call, assisting in theatre and time for self-study as instructive elements. Recommended clerkship components are: active involvement of students, direct observation, selection of teachers, a positive learning environment and time for self-study.

Clinical clerkships can offer students a rich variety of learning experiences. In general, however, the educational quality of individual clerkships is highly variable. Jolly compares medical education to minestrone soup: " ... lots of little bits, all chopped up, floating in a sea of indeterminate nutritional value ...".[1] Previous studies have shown clerkship learning experiences to differ not only between hospitals, but also - and even more so - between individual students.[2,3] Some students see more patients and practise more skills than their colleagues.

We know little about the causes of those differences and what would make a clerkship more effective. Clerkships are an educational 'black box'. It is generally assumed that a solid educational structure would make clinical learning less haphazard. Several attempts have been made to bring more educational structure to clinical clerkships, such as the use of student logs stating the learning objectives of clerkships.[4,5] Besides more structure, observation of students' clinical skills and feedback on their performance are generally considered to be key elements for clinical educational improvement. Equally generally, students say that both observation and feedback are rare.[6]

We were interested in the opinions of students on the quality of their clinical education and possibilities for improvement. To do so we collected, analysed and compared the clerkship experiences of students who had done a surgical attachment in a university hospital where more structured teaching components had recently been introduced and students whose surgical attachment had been largely unstructured. Students from both clerkships took part in focus group discussions intended to elucidate which educational elements and moments students perceive as positive contributions to a surgical clerkship's educational quality.

We sought answers to two questions: a) which learning experiences contributed to students' learning during the surgical clerkship? and b) what do students who did a more structured clerkship and students with traditional clerkship experience think about the structured clerkship components recently introduced at the academic hospital?

***Methods***

*Context of the study*

At the Medical School of the Vrije Universiteit Medical Centre, Amsterdam, the Netherlands, clerkships start in year five of the undergraduate curriculum after four years of pre-clinical education. The ten-week surgical clerkship is compulsory for all students and students are randomly allocated to the university hospital or to one of the regional general teaching hospitals for the surgical attachment. In the surgical clerkship students' guidance and supervision comes from surgeons and surgeons in training (residents). Generally, undergraduate students receive most of their clinical education from residents.

The teaching hospitals provide traditional, unstructured clinical training, apart from small group teaching sessions twice weekly about a general surgical topic, e.g. cholelithiasis. By contrast, form and content of the surgical attachment at the university hospital were restructured in 1999. At the start of clerkship students receive a pre-coded student log in which learning objectives are described. In addition, the following structured teaching activities are offered:

- Students are observed once during history taking and physical examination in an incoming patient.

- Students summarise medical notes on ten different patient cases.
- Students present four case histories.
- Students give one presentation on a surgical subject based on the recent surgical literature.
- An individual appraisal interview halfway through the clerkship.
- An individual appraisal interview is conducted at the end of the clerkship.

Feedback on the structured teaching activities is provided by surgeons and residents.

*Method*

Focus group discussions are a method to elicit a wide range of ideas and opinions on a well-defined topic. Group members are selected for their expertise or experience in the subject under discussion. During the discussion participants stimulate one another to generate ideas from different perspectives. In this way a broad overview and fairly rich qualitative data are gathered, comparable to those obtained with other qualitative research methods, such as in depth interviews, but less expensive to obtain.[7,8]

The focus groups were composed of students with different clerkship experiences, i.e. the recently structured clerkship at the university hospital (university hospital clerks) or the traditional unstructured clerkships in the teaching hospitals (teaching hospital clerks). We hoped that bringing students with different experiences together in one focus group would stimulate the discussions. Two mixed groups each met twice. The second session was organised to check the consistency of the findings.

*The participants*

We recruited medical students who had recently (< two months ago) finished the surgical attachment either at the university hospital or at one of the teaching hospitals. We wanted the focus groups to consist of equal numbers from both groups of clerks. Students were invited by mail to participate in two focus group sessions on two selected dates. Participation was rewarded by a small fee.

Of twelve students (six university hospital clerks and six teaching hospital clerks) invited to participate in focus group I, eight responded (75 %): three (two females, one male) from the university hospital and five (four female, one male) from a teaching hospital. Of fourteen students invited to participate in focus group II, eleven responded ( 79 %): seven (six female, one male) from a teaching hospital and four (two female, one male) from the university hospital.

Reasons for non-participation were holidays and other clinical attachments on the dates of the focus group sessions.

*Procedure*

Both focus groups met twice for 1.5 hours with the same two moderators. At the start of the first session the moderators assured the students that full confidentiality was guaranteed. Students were asked to reflect on the focus group questions. Moderator I (HvdH) guided the group discussion, while moderator II (HD) took notes and critically followed the discussions, asking questions to clarify points whenever appropriate. The first session was audiotaped and videotaped and a summary of the transcripts was mailed to the participants. In the second session, participants were asked whether the summary accurately reflected the content of the discussions during the first session. Two participants of focus group I and three participants

of focus group II, who did not attend the second session, sent written comments on the summary. The final report of the two focus group discussions was written after the second session.

*Starting questions used in the focus groups*
We asked the participants to explore the following questions:

1. Which learning experiences contributed to the learning during the surgical clerkship?
2. What do you think about the more structured components of the surgical clerkship in the academic hospital?

***Analysis***
Moderator I analysed the transcripts of the first session of the two groups. Three themes were identified and a summary was written for each theme. The summarized report of the first focus group session was critically discussed with moderator II. Points from the first sessions that needed clarification were used as guidelines for the second sessions. The final report was written by moderator I and submitted to moderator II for approval. After approval by all participants, the final reports of both focus groups were presented to two experts in medical education (AS, CvdV) who had not attended the focus group sessions. They concluded that the content of the discussions was comparable for groups I and II. As a result a third focus group was not considered necessary.

***Results***

The results of the two focus groups have been categorised under the following themes:

1. Positive learning experiences mentioned spontaneously by students
2. Learning experiences in (non-)structured teaching sessions
3. Other meaningful learning experiences

Quotations from the focus group discussions are given to illustrate the themes. For each theme we describe the learning experiences and the responses to the new structured components.

*Positive learning experiences, mentioned spontaneously by students*

Both focus groups spontaneously and unanimously stated that in their opinion structured observation by and feedback from hospital staff contributed most to their clinical competence.

Observation of and feedback on a student-patient encounter by hospital staff.
All participants said that observation of a student–patient encounter by hospital staff was a powerful stimulus to learning. Apart from having their mistakes pointed out to them, students greatly appreciated being told which parts of history and physical examination they had performed correctly.
University hospital clerks reported that being observed during a patient encounter was very instructive, albeit that only one structured teaching session was dedicated to this learning

activity. Clerks from the teaching hospitals were not observed at all during history taking and physical examination. Students unanimously stated that on the whole direct observation by clinical staff was a rare occurrence.

> *In our hospital we were never observed during a patient encounter. I think it's a shame… You didnt know if you performed well or made awful mistakes. The supervisors believed you blindly. It was up to you to report it when you felt something was wrong.*

Observation by students of a doctor-patient encounter.
Students found this only instructive early in the clerkship. Then it was useful for familiarizing themselves with the work in the department.

> *I think it's little things, useful tips you get from watching a physician. Everyone can perform a basic history and physical. One physician does it this way and another one does it that way, so you get to choose the way you prefer.*

As the clerkship progresses students no longer find it instructive to just observe a supervisor without being actively involved themselves. Their attention wanders. Watching the doctor-patient encounter becomes a far more stimulating experience when the student sees the patient first. Students are curious to see whether the supervisor will do the same things they did. The students said that rotations in the emergency room provided the best opportunities for first seeing a patient, then returning to the patient with their supervisor and receiving feedback, all within a relatively short time.

> *As for me, when I'm accompanying someone half of what happens goes past me, because I'm just standing there. In the emergency room I saw the patient first and then observed the resident. I learned a lot from that.*

> *When you went to see the patient for the second time, together with the doctor, you sometimes noticed things that you had overlooked the first time because you're inexperienced. It was very nice when the doctor noticed the same things you had seen .....*

Feedback.
All students agreed that feedback is a key factor to effective learning. Feedback should be constructive, be provided in a safe atmosphere and include positive as well as negative aspects.

> *The tone that is used. You don't feel safe when you know you will be told off in front of the whole group.*

> *A negative experience: not getting any feedback at all. It's very unpleasant when there just isn't any contact at all with someone. An example of a positive experience: someone who just mentioned what you had overlooked and responded positively to what you did well. Both sides are attended to. Some people find it very hard to do this.*

At all hospitals it appeared to depend on the individual member of staff students worked with whether they received spontaneous feedback during their daily work or not.

Some people are very good at giving feedback, some people less so, whether they are residents or surgeons. It depends on a person's didactic qualities if feedback is useful or not.In general, students were supposed to ask for feedback themselves.

> *In the outpatient clinic I would have liked feedback from a surgeon, but that happens only very rarely. It's really ridiculous.*

Students reported that most feedback was provided by residents. Students found it easier to ask residents for feedback than surgeons. They did not ask surgeons for feedback when they felt insecure about something, for fear of being considered incompetent. Students in both focus groups reported that there was a difference in feedback between junior and senior residents. Students said that junior residents paid almost no attention to their clinical activities and thus failed to provide constructive and useful feedback.

> *I preferred feedback from a surgeon. My resident had just started on my ward. He was very busy with his own clinical tasks. He had no idea what I was supposed to learn during my stay on his ward…*

The surgical clerkship, both at the university hospital and at the teaching hospitals, was found to be lacking in feedback on differential diagnosis and therapy.
University hospital clerks received feedback during organised teaching sessions. The feedback they received on the observed student-patient encounter, in the halfway appraisal, and after their presentations was perceived as informative, constructive and to the point. Opinions differed about the quality of the feedback on the summaries of medical reports, patient presentations and the end-of-clerkship appraisal.

*Learning experiences during (non-)structured teaching sessions*

Medical reports.
All students agreed that writing a medical report contributed to their learning, even when these reports were not critically reviewed by supervisors. Writing a medical report was perceived as a stimulus to logical thinking and helpful in making a differential diagnosis.

> *Writing a medical report stimulates your thinking. While writing a medical report you realize that you didn't collect all the relevant patient information. You cannot record things you didn't ask. But you can return to the patient and ask .....*

All students agreed that feedback on written medical reports was only rarely given. During the outpatient clinic rotations in particular, supervisors did not provide such feedback. As reasons for this lack of feedback students cited the high turnover of patients and there being insufficient time to discuss the medical report in between student-patient encounters.

*In the outpatient clinic my medical reports were never looked at. My supervisor came by, looked at the GP's correspondence, turned to the patient and wrote down his own conclusions. He didn't even look at my medical report.*

*60 patients to be seen between nine and twelve pm. The supervisor didn't pay any attention to me personally: "Tell me about the patient's problem. Oh, I see". He didn't look at any of the medical reports I had written that morning.*

University hospital clerks reported that feedback given by residents in structured teaching sessions on a written summary of a medical report was not always as instructive and informative as they thought it might be. They missed discussions about differential diagnosis and proposals for treatment in particular. They also reported that the quality of the feedback largely depended on the person providing the feedback.

*They didn't look at any of the differential diagnoses I had written. After a while I did not record a DD any more. My supervisor said: "We'll treat this patient this way or that way." and I just thought: Wise advice, I suppose.....*

*I learned a lot from the feedback from my supervisor. She read my medical report and complimented me about the way I had reported the patient's medical history. But she asked me to motivate my differential diagnosis. "Think aloud" she said "You can do better than that." She was right…...*

Presentation of a case history.
All students agreed that presenting a patient's case history in front of the surgical staff could be an instructive experience. Students said that discussions among clinical staff about patient problems in which the student did not play an active part could also be useful to them.

*During report it is often debated what to do with a certain patient: procedure or not. All physicians are present and you're also there as a clerk. Discussions are much easier to follow than during rounds or on the wards. Everything goes way too fast then ....*

University hospital clerks said they appreciated the possibility for rehearsal of their presentation with a resident and the questions asked by clinicians after the presentation.

*When you had admitted a patient in the morning, you always talked briefly with the resident. You were able to ask questions ..... It gave you more confidence when you had to present a patient. Afterwards questions were asked. Sometimes you did'nt know the answer, well, it happens, but it was instructive anyway. At first I didn't see it that way, the first time I was very nervous, but then I came to see it more as a learning experience than as a possibility for failure.*

During rehearsals attention should be paid to differential diagnosis, further diagnostic investigations and therapeutic options. Otherwise a patient presentation is no more than an exercise in presentation skills. When clinicians asked critical questions after the presentation

of a patient problem, students experienced this as very constructive and informative.

> *Clinical staff asked critical questions about the indication for the operation. Well, such questions help to make you aware of the patient as a whole person, not just a colon carcinoma.*

Presentation of a surgical topic.
University hospital clerks as well as training hospital clerks agreed that presenting a surgical topic using the recent surgical literature was a useful learning experience. They valued this as an opportunity for deepening their knowledge about a surgical subject.

> *You are encouraged to really study a topic in depth. You also learn from listening to a presentation by one of your fellow clerks.*

Individual appraisal halfway through and at the end of the clerkship.
(a) Halfway appraisal. Only at the university hospital do students receive feedback on their strengths and weaknesses in a halfway appraisal interview with one of the educational coordinators of the surgical clerkship. During these interviews students learn about their good or poor performance of different skills and receive advice about learning objectives to be attained during the weeks ahead. Students found these interviews very informative and constructive and some students reported they had actually followed the advice they were given. The students from the teaching hospitals, where no such interviews are held, reported that they would very much have appreciated a similar individual appraisal.

> *I would have liked a halfway appraisal. To hear what they think of your functioning and to be able to say what you think. This gives you something to go on for the next four weeks. I really felt completely in the dark at one point during the clerkship.*

(b) End of clerkship appraisal. At the end of the clerkship students at all hospitals were invited for an interview with one of the members of the surgical staff. None of the students found these final interviews very constructive, informative or to the point. According to the university hospital clerks, the main reason for this is that the surgeon who conducted the interview hardly knew them personally. In the opinion of the students the final appraisal did not focus on their individual strengths and weaknesses and therefore remained superficial.

> *I had the final appraisal with a surgeon I had only talked to three times. He went through the log and then took an hour to try and talk me into becoming a surgeon. And then he said, you have done really well. I think he only said that because I had been honest with him. Apparently, he thought I would be all right in the end. I'am quite sure he had no idea of how I had really done.*

Teaching hospital clerks also considered the end-of-clerkship appraisal rather superficial. Although there are fewer clinical staff than in a university hospital, students reported that clinical staff only saw the student in the operating theatre and during short outpatient encounters. Staff members rarely discussed student's personal functioning with the resident with whom the student worked most of the time.

*We knew beforehand how our surgical clerkship would be evaluated. All students were told they had done well!*

All students supported the idea that appraisal can contribute to learning in a clerkship. Topics to be discussed in the interview should focus on: a) the student's attitude towards patients and their family, medical staff, nursing staff and fellow students, b) history taking and physical examination skills, c) writing medical reports including differential diagnosis and therapy, d) advice on how to improve their future performance.

Small group teaching sessions.
At both types of hospitals small group teaching sessions on general surgical topics by clinical staff were scheduled regularly. Also at both types of hospitals students reported frequent cancellation of these sessions. Students found the sessions informative and instructive, because they encourage them to make the connection between day-to-day medical practice and theoretical knowledge. That is why students prefer teachers who present a patient problem first, and put it in a broader medical context afterwards. Students also think that teachers should come to the sessions well prepared.

*The small group teaching sessions were so unstructured! The teacher came in and said: What shall we talk about today? Some students suggested a subject, but halfway through the session it was often impossible to follow the thread of the presentation, because the teacher had got sidetracked into a totally different story.…*

In the opinion of the students, both surgeons and residents can be good teachers, provided they prepare for teaching sessions. Some students favoured residents as teachers:

*It's easier to ask a resident a question than a surgeon. I did not dare ask a surgeon a question during the teaching session. Not me! He'll probably just think I'm stupid….*

*Other meaningful learning experiences*

On call duty.
Students held different opinions about the educational value of on call duty depending on the degree of involvement. Some duty teams accepted the student as a full member of the team and stimulated active participation. Students were encouraged to give their opinion about differential diagnosis and therapy and they could ask questions. Other teams gave the students tasks of limited instructive value, like taking blood samples, finding X rays, et cetera.

*To my mind when you are on call you are more involved in thinking about therapy. The resident is generally the only one present so you are more often called upon and involved more.*

*One resident was just perfect. He told me a lot of things and we had meals together. The other one only made me do all sorts of chores. Well I thought that was .... and you learn*

*nothing.*

Self study.

All students agreed that their surgical knowledge from the pre-clinical years had faded when they entered the clerkship. During clerkship students had hardly any time for studying. They tried to study at home, but were often too exhausted after the long hours in the hospital.

> *Sometimes I was on 24-hour duty twice a week. And the next day you had to go on as usual. I was exhausted. You just stopped studying.*

> *Looking up something when I had seen a patient and there was something I did not understand, I did that quite often. It's quite easy to fit in with other things, but really studying ... no, I found that very hard to do.*

Most students did not do any serious studying until the last four weeks of the clerkship, and then mainly because the final surgical exam was approaching. They all agreed that it would have been a good thing if they had reviewed their surgical knowledge at the start of clerkship. They would have benefited from that and enjoyed the clinical work more.

> *You discover that it's much better to assist at an operation when you know what is going on (with the patient). There comes a moment when you realise: it is very nice to understand what it is they are doing. But you don't realise that until later in the clerkship.*

Assisting in the operating theatre.

All students agreed that assisting in theatre can be instructive and informative.

> *The patient's problems became visible during the operation. I found that very instructive. Especially when the operation team asked questions and explained the procedure, students valued assisting in theatre more positively.*

In some of the teaching hospitals students had a one week rotation in the operating theatre. They assisted at all operations scheduled in that week.

> *My one week in the operating theatre was useful for my technique, but I hadn't seen any of the patients in advance. One time I was on duty on a Sunday and saw some patients admitted. The next day I assisted in theatre and saw these patients again and realized that it was much more interesting if you understand why we were operating on these patients.*

All students supported the idea that there should be time scheduled for self-study to prepare for the operation of their own patient, because then they would learn more from assisting in theatre.

***Discussion***

In this study we identified some nutritious elements of the educational diet served by a partially structured surgical clerkship and by unstructured clerkships. Observation of student-patient encounters, constructive feedback, presentations on surgical topics, patient notes, appraisal with informed individual feedback, being on call, assisting in theatre, refreshing surgical knowledge before and time for self-study during the clerkship were seen by all students as contributing to the clinical learning experience. It is striking that the main features that determine educational value appear to be active involvement of students and constructive feedback from clinical staff in a positive atmosphere.

Clerks from the teaching hospitals and the university clerks generally responded positively to the newly introduced structured components in the university hospital. Despite the positive effects of the restructured clerkship, however, further improvement of the quality of learning during this clerkship is possible. Additional educational requirements also need to be met, like active involvement and feedback during structured learning activities. The discussions in both focus groups have generated the following recommendations for quality improvement in clinical education:

1. Active involvement of students should be promoted.

Active involvement of learners enhances the formation of powerful conceptual structures.[9] Activities like observing a supervisor at work without having seen the patient first, assisting in theatre without knowledge of the patient's problem, listening to a lecture without being asked questions contribute little to students' learning. Students can be actively involved when they see a patient first before observing the doctor-patient encounter and discuss the patient's problem with their supervisor afterwards. Also preparation for operations and interactive lectures can stimulate involvement. Another way of involving students in clinical care, which was not brought up during the focus group discussions, is to make a student responsible for a number of patients.[10] Other studies have shown the importance of allowing students to assume increasing levels of responsibility.[11,12]

2. More direct observation

Most of the time when students are working on the ward and in the outpatient clinic they are not observed. Observation of student-patient encounters with feedback, although very time consuming, can be very informative to student and teacher alike. Lack of time seems to be one of the reasons that students are rarely observed by surgeons or residents. Nevertheless, the educational quality of a clerkship depends crucially on clinical teachers who take time to observe students and stimulate them by giving appropriate feedback.

3. Select the teachers

The students had very clear ideas about the qualities of a good teacher: a good teacher should prepare for teaching, provide constructive feedback in a positive atmosphere, observe and demonstrate clinical skills, and stimulate students' clinical reasoning skills by asking a lot of questions. This study has demonstrated that not all teachers fulfil these expectations, even when they know what is expected of them. Medical teachers can be trained to become better teachers.[13] Training sessions would have to be followed up by periodic refresher courses to retain and extend improvement.[14] This study has also shown that residents provide much

of clinical teaching. We would strongly support incorporation of a compulsory module on medical education in residency training. It may be worthwhile to target medical education courses at a select group of clinical staff members, for instance those who supervise students who are responsible for the care of a number of patients.

4. Create a positive learning environment
The remark that students did not dare ask questions for fear of seeming stupid offers food for thought. The more so since this finding has also been reported by others.[15] We think it is of the utmost importance that a positive learning environment is created in which students feel free to ask questions. The teacher plays a key role in creating such a learning environment.[16]

5. Include protected time for self study time in the clinical clerkship
Students made it very clear that the general surgical knowledge gained prior to the clerkship needed to be activated. Lack of time, however, meant that students did not do much studying until the last few weeks before the final surgical exam. During clinical clerkships students are supposed to apply their theoretical knowledge in clinical practice. It is doubtful whether students obtain the maximum profit from a clerkship when they do not activate prior theoretical knowledge before embarking on clinical work. Students should have time for self-study earlier in the clerkship. We would recommend that self-study be stimulated by some form of assessment in the first weeks of clerkship or just before the start of the clerkship. It is known that a scheduled assessment or examination has a positive effect on the learning of students.[17]

**In conclusion**
In this study it was possible to identify learning experiences with a positive impact on the learning of our students. The effect of structuring the clerkship was generally positive and the results of the study show the way towards further improvements.

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# CHAPTER 5

## RELIABILITY OF THE CLINICAL TEACHING EFFECTIVENESS INSTRUMENT FOR APPRAISAL OF INDIVIDUAL AND GROUP TEACHING QUALITY

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***Summary***

*Introduction.* Copeland and Hewson developed The Clinical Teaching Effectiveness Instrument to evaluate the quality of educators' clinical teaching. They reported evidence supporting content and criterion validity and favourable reliability findings. We tested the instrument's validity and reliability in a European context and investigated its reliability as an instrument to evaluate the quality of clinical teaching at group level rather than at the level of the individual teacher.

*Methods.* Students, participating in a surgical clerkship, were asked to fill in the questionnaire reflecting a student-teacher encounter with a staff member or a resident. We calculated variance components using the UrGenova program. For individual score interpretation of the quality of clinical teaching the Standard Error of Estimate was calculated. For group interpretation we calculated the Root Mean Square Error.

*Results.* Differences between staff and residents were not statistically significant. The average score was 3.42. The largest variance component was associated with rater variance. For individual score interpretation a reliability of >0.80 was reached with seven ratings or more. To reach reliable outcomes at group level, fifteen educators or more were needed with a single rater per educator.

*Discussion*. The required sample size for appraisal of individual teaching is easily achievable. Reliable findings can also be obtained at group level with a feasible sample size. The results provide additional evidence of the reliability of The Clinical Teaching Effectiveness Instrument in undergraduate medical education in a European setting. The result also showed that the instrument can be used to measure the quality of teaching at group level.

The quality of clerkships as a learning environment is increasingly being studied.[1-4] It appears that the clinical environment is not always as optimal for the learning of students as we often assume. Particularly the way in which this environment is structured gives rise to concern. In this respect Jolly compared medical education in clerkships to a "minestrone soup": lots of little bits, all chopped up, floating in a sea of indeterminate nutritional value.[5] A number of instruments for evaluating the quality of clerkships has been proposed and their measurement qualities have been evaluated.[6-10] It is generally assumed that a solid educational structure would make clinical learning less haphazard. However, apart from structuring the clinical learning environment, one should pay attention to the educators in it. Clinical teachers' educational expertise influences the effectiveness of a clerkship as a learning environment.[11] Recently, Copeland and Hewson reported on a generic – department-independent – instrument for rating the quality of teaching, the Clinical Teaching Effectiveness Instrument. (CTEI)[12] This instrument is based on theoretical research and empirical qualitative verification. It consists of a questionnaire addressing fifteen indicators of teaching effectiveness. Students are expected to complete the questionnaire after interaction with an educator. For each educator multiple ratings are assembled. The items of the questionnaire are presented in table 1. The mean score of all items is taken as an indicator of overall teaching effectiveness. It can be reported to educators as feedback, which may also be used for remediation purposes. Copeland and Hewson examined the reliability and validity of the instrument.[12] Their study showed that the reliability of the instrument was high and that as few as two or three ratings were sufficient to achieve a reliable effectiveness score for an individual educator. They also reported evidence in support of the instrument's content and criterion-related validity.

The CTEI was developed, used and validated in the USA and the question was if it would be equally applicable in a European context. That is why we tested the instrument in a Dutch medical school. For this study the instrument was translated into Dutch. We were interested in two aspects of the reliability of the instrument. First, we wished to determine the reliability of the CTEI as a tool for appraising the teaching effectiveness of individual clinical staff and residents involved in undergraduate clinical teaching. We wanted to include residents as teachers in this study, because they are often substantially engaged in the teaching of undergraduate students.[1,3,13] Basically, the first research question entails replication of the findings of the Copeland and Hewson study, only this time for a translated version of the instrument to be used for staff and residents involved in undergraduate clinical training in a European setting. Secondly, we wanted to investigate the reliability of the instrument in appraising the quality of a group of educators. So, instead of using the findings to infer the educational quality of individuals, we wished to measure teaching quality at group level. This perspective is particularly relevant for evaluation studies, for example to determine the educational quality of a department as a whole or to evaluate the effectiveness of a certain intervention in relation to a group of educators previously selected by the instrument. This

resulted in the following research questions:

1. How many repeated ratings by different students are needed to achieve a reliable score for an individual educator?
2. How many ratings and educators are needed to yield a reliable mean score for a group of educators?

***Methods***

*Instrument, Subjects and Procedure*

After permission was obtained from the authors, the CTEI was translated into Dutch. The Dutch translation was translated back into English by a professional translator and the new English translation was compared with the original English version. After careful appraisal, the authors concluded that the two versions were identical as regards content. The Dutch version of the CTEI is available from the first author.

The Dutch version of the CTEI was used in an undergraduate surgical clerkship at the VU Medical Center, Amsterdam, The Netherlands between August 2002 and April 2003. During this period undergraduate medical students evaluated 51 educators. The number of evaluations per educator ranged from 1 to 13. The surgical clerkship lasts ten weeks and students rotate in the surgical inpatient clinic (four weeks), the urology outpatient clinic (one week), the orthopaedics outpatient clinic (one week), the outpatient clinic of general surgery (two weeks) and the emergency rooms (two weeks). In all these rotations students are supervised in daily clinical practice by staff and by residents (i.e. junior doctors doing surgical specialty training, which generally lasts six years). During the clerkship, students participated in structured assessments, bedside teaching, small group teaching and individual appraisal by staff halfway and at the end of the clerkship. When data collection started, all educators involved in the clerkship were informed in writing that they would be evaluated by students using a questionnaire. The educators were assured that anonymity was guaranteed when data were communicated to others besides the researchers. They were also given the opportunity to discuss their individual outcomes in a private meeting with the first author. The students who did the surgical clerkship during the study period were asked to fill in the questionnaires anonymously. It was up to them whether they chose to comply with our request. Every week students selected a resident and a member of staff for evaluation by means of the questionnaire in that week. The questionnaires were handed out to the students every week and collected at the end of the week. Students were free to determine when to fill out a questionnaire and in which setting to evaluate teaching behaviours. For example, the questionnaire could be completed immediately following a student-teacher encounter or at the end of a work day after the student had reflected on the encounter; teaching behaviour could be appraised during ward rounds or in structured assessments.

***Statistical analysis***

From the available data of 44 different educators we could use the data of 37 educators (16 clinical staff and 21 surgical residents), for whom at least four evaluations by different students were available. As was done in the original study, we performed a generalisability analysis. Generalisability theory allows an estimation of the reliability of a measurement by estimating the size of various sources of variance that affect the measurement. This is done by an ANOVA study followed by a variance component estimation procedure that expresses the relative magnitude of these sources of variance to each other. Depending on the purpose for which the researcher wishes to use the instrument, i.e. the kind of generalisations, and the (intended) plan of sampling, an estimate is made of the error variance. This can be used to estimate reliability indices, either as a standard error of estimate (SEM; the root square of the error variance) or as a generalisability coefficient (a ratio between "wanted" variance (true score variance or universe score variance and total variance (sum of "wanted" and "unwanted" (error) variance). In our study we used mixed ANOVA model: a two-facet design with raters (students; r) nested within educator (p) crossed with fifteen fixed items [(r:p)×i]. Since items were not always applicable for every evaluation, some items were not included in the analysis. This meant that we used an unbalanced design, because for some educators fewer than fifteen items could be analysed. For an unbiased estimation of variance components, variance components were estimated for residents and staff separately and subsequently pooled (weighted by sample size) into one estimate. We calculated the variance components using the UrGenova program.[14] Instead of calculating generalisability coefficients, we estimated Standard Errors of Measurement (SEM) as dependent variables. We did so because SEMs can be interpreted on the original scoring scale, therefore allowing us to better define the maximum acceptable noise in the measurement, and because of the fact that generalisability coefficients cannot be calculated for our second research question in relation to the group score interpretation (due to the absence of a true score or universe score estimate). For the first research question – individual score interpretation – we estimated the SEM as:

$$SEM = \sqrt{\frac{\sigma^2_{r:p}}{N_r} + \frac{\sigma^2_{ri:p}}{N_i \times N_r}}$$

In which $\sigma^2_{r:p}$ is the variance between raters within educators and $\sigma^2_{ri:p}$ is the interaction between raters and items within educators. Each variance component was divided by the sample size associated with the component.

For the second research question – group interpretation – we calculated the Root Mean Square Error (RMSE) which can be interpreted in the same way as the SEM but now at group level. We estimated the RMSE as:

$$RMSE = \sqrt{\frac{\sigma_p^2}{N_p} + \frac{\sigma_{r:p}^2}{N_r \times N_p} + \frac{\sigma_{ri:p}^2}{N_r \times N_i \times N_p}}$$

The SEM was estimated as a function of the number of different samples of raters and the RMSE was estimated as a function of the number of different samples of raters and educators. The CTEI uses a 5-point Likert scale. We wanted a difference of at least one unit on the scale to be interpreted reliably. We therefore used an SEM or RMSE of <0.26 ($1.96 \times 0.26 \times 2 \approx 1$) as the smallest allowable value for a 95% confidence interpretation.

***Results***

Because there were no statistically significant differences between the scores of the staff members and those of the residents (data not shown), we report on the data set as a whole. Table 1 shows the response rate for every item, descriptive statistics for all fifteen items and the total score.

The mean score was 3.42. Item scores ranged from 3.85 (item 1: establishes a good learningenvironment) to 2.55 (item 15: teaches principles of cost-appropriate care). Response rates varied between 68.9% (teaches principles of cost-appropriate care) and 100% (establishes a good learning environment; stimulates me to learn independently; asks questions that promote learning).Table 2 presents the estimated variance components.

The standard errors in the table reflect the precision with which these estimates could be calculated. They are sizable for the p en r:p effect and reflect the relatively small sample size in this study. The largest variance component was associated with rater variance (r:p). Apparently, students differ substantially in leniency/stringency of judgement of educators' teaching quality. The second largest term was the rater by item interaction (ri:p), but this term also includes general error and is usually a large term in any generalisability study. In table 3 SEMs are presented.

For individual score interpretation, a SEM of <0.26 was reached with seven ratings or more. For group score interpretation, table 3 indicates that with a single educator no reliable data can be obtained regardless of the number of raters. With a sample size of five educators, at least ten raters are needed per educator. Alternatively, with a single rater per educator about fifteen educators or more are needed for a reliable outcome. It is clearly a wiser strategy to increase the number of subjects within a group than to increase the number of ratings for an individual within a group.

Table 1. Items and descriptive statistics of the original Clinical Teaching Effectiveness Instrument.[10] (n=37)

| Item Number | Item | Response Rate | Mean* | SD* |
|---|---|---|---|---|
| 1 | Establishes a good learning environment | 100% | 3.85 | 0.85 |
| 2 | Stimulates me to learn independently | 100% | 3.57 | 0.74 |
| 3 | Allows me autonomy appropriate to my level/experience/ competence | 97.3% | 3.81 | 0.63 |
| 4 | Organizes time to allow for both teaching and care giving | 95.9% | 3.39 | 0.83 |
| 5 | Offers regular feedback (both positive and negative) | 98.6% | 3.41 | 0.72 |
| 6 | Clearly specifies what I am expected to know and do during this training period | 94.6% | 3.31 | 0.68 |
| 7 | Adjusts teaching to my needs (experience, competence, interest, etc) | 94.6% | 3.51 | 0.76 |
| 8 | Asks questions that promote learning (clarifications, probes, Socratic questions, reflective questions, etc) | 100% | 3.47 | 0.84 |
| 9 | Gives clear explanations/ reasons for opinion, advice, actions, etc | 99.3% | 3.61 | 0.70 |
| 10 | Adjusts teaching to diverse settings (bedside, view box, OR, exam room, microscope, etc) | 83.1% | 3.57 | 0.65 |
| 11 | Coaches me on my clinical/ technical skills (interview, diagnostic, examination, procedural, lab, etc | 83.1% | 3.16 | 0.75 |
| 12 | Incorporates research data and/ or practice guidelines into teaching | 84.5% | 3.18 | 0.88 |
| 13 | Teaches diagnostic skills (clinical reasoning, selection/ interpretation of tests, etc) | 84.4% | 3.45 | 0.83 |
| 14 | Teaches effective patient and/or family communication skills | 78.4% | 3.18 | 0.70 |
| 15 | Teaches principles of cost-appropriate care (resource utilization, etc) | 68.9% | 2.55 | 0.76 |
| **Total** | | **90.9%** | **3.42** | **0.63** |

* Items are rated on a five-point scale (1= never/poor; 5=always/superb)

**Table 2.** Variance component estimates of rater-within-educator-by-item design.

| Source | Variance Component | Standard Error | Percentage of Total Variance |
|---|---|---|---|
| Educator (p) | 0.303 | 0.095 | 24% |
| Rater within educator (r:p) | 0.428 | 0.057 | 34% |
| Item (i) | 0.094 | - | 7% |
| Educator-item interaction (pi) | 0.058 | 0.010 | 5% |
| Rater-item interaction within educator (ri:p) | 0.384 | 0.014 | 30% |

**Table 3.** Standard errors of measurement for individual score interpretation (SEM) and group score interpretation (RMSE) as a function of sample size (the sample sizes used in this study are in bold italics).

| | | N raters (students) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **Individual Score Interpretation (SEM)** | | .67 | .48 | .39 | ***.34*** | .30 | .27 | .25 | .24 | .22 | .21 |
| | **N Educators** | | | | | | | | | | |
| **Group Score Interpretation (RMSE)** | 1 | .87 | .73 | .67 | .65 | .63 | .62 | .61 | .60 | .59 | .59 |
| | 5 | .39 | .33 | .30 | .29 | .28 | .28 | .27 | .27 | .27 | .26 |
| | 10 | .28 | .23 | .21 | .20 | .20 | .19 | .19 | .19 | .19 | .19 |
| | 15 | .22 | .19 | .17 | .17 | .16 | .16 | .16 | .15 | .15 | .15 |
| | 20 | .19 | .16 | .15 | .14 | .14 | .14 | .14 | .13 | .13 | .13 |
| | 25 | .17 | .15 | .13 | .13 | .13 | .12 | .12 | .12 | .12 | .12 |
| | 37 | .14 | .12 | .11 | ***.11*** | .10 | .10 | .10 | .10 | .10 | .10 |
| | 50 | .12 | .10 | .10 | .09 | .09 | .09 | .09 | .08 | .08 | .08 |

***Discussion***

This study partly replicated an earlier study on the Clinical Teaching Effectiveness Instrument. The difference was that in this study a translated version of the instrument was used in an undergraduate training context. All raters were undergraduate students and the educators involved were both residents and clinical staff. The average score on all items was 3.42, which is lower than that reported in the original study (4.12).[12]

The reliability findings in our study were less favourable than in the earlier reported study. At least seven or more ratings were needed to achieve a reliable inference concerning the total score on the CTEI for an individual educator. Copeland and Hewson reported generalisability coefficients instead of SEMs. The Generalisability Theory takes into account multiple sources of variance. In this study sources of variance were calculated. To determine the 'true variance' and by comparing this true variance to the 'false variance', one is able to estimate generalisability coefficients. The generalisablity theory is useful in those studies in which multiple sources of variance will influence the measurement but one still wishes to calculate one integral estimation of reliability. Reliability can also be expressed by calculating the Standard Error of Mean (SEM) In this study we preferred calculating the SEM. By using SEM the error of measurement can be expressed in a scale score. This gives us the opportunity to judge the acceptability of error. The outcome is a criterion for minimal reliability scale. For ease of comparison, in the study of Copeland and Hewson generalisability coefficients of respectively 1, 6 and 7 raters were 0.74, 0.94 and 0.95, whereas we found generalisability coefficients of 0.40, 0.80 and 0.83 for the same numbers of raters.

The difference between the two studies can be attributed to the educator by item variance component, i.e. the differences between educators in performance across items. In a design with items as a fixed facet, this component is considered as "wanted" variance: the same items are used in every measurement, so the variance between educators on this facet will contribute to the discrimination between educators. The educator by item variance component in our study was rather low compared with that in the original study. This suggests that in this study the correlations between questionnaire items are higher than in the original study. Although less favourable, the required sample size remains well within a feasible range, since the required sample size of seven or more students seems easily achievable.

The second research question concerned the reliability of the CTEI for the interpretation of group results. The reliability findings concerning group results can be used to optimise sampling in an evaluation or intervention study. The results showed that in order to achieve a reliable group score it would be more efficient to increase the number of educators in the sample than to increase the number of ratings for the educators. Even with a single rating per educator a reliable score can be obtained with a group of no more than fifteen educators. With two ratings per educator, ten educators would be sufficient. Intervention studies of staff development measures are often restricted by practical constraints and sample sizes are limited. This study shows that reliable findings can be obtained with feasible sample sizes.

The rather small sample size in this study limits the generalisability of the findings. Within these limitations, the results provide additional evidence for the reliability of the CTEI. The results can also help to optimise the sampling strategy for future studies, using this instrument for appraisal of both individual teaching qualities and teaching quality at group level.

The quality of teaching effectiveness is important not only for medical students and departments but, nowadays, also for individual teachers themselves in terms of professional performance appraisals. Further research using the CTEI should address its implications for practice. E.g.: are educators willing to accept their individual scores? What are the effects of certain interventions, for example an educational training, on the CTEI outcomes of individual teachers as well as on outcomes at group level? Is it possible to use CTEI outcomes for the selection of teachers for remediation purposes?

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# CHAPTER 6

## IMPACT OF STRUCTURED TRAINING ON RESIDENTS EDUCATIONAL PERFORMANCE

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Submitted

# Chapter 6

***Summary***

*Introduction:* In the opinion of medical students, most of the teaching during clerkships is provided by residents. In the present study we addressed the question whether educational training and feedback improve the teaching quality of surgical residents.

*Methods:* Students were asked to rate a student-teacher encounter with a resident, using a validated instrument for measuring teaching quality, demonstrated to be usable in the European setting (Clinical Teaching Effectiveness Instrument, CTEI). Fifteen residents participated in a two-day educational training programme. Quantitative outcome measures were obtained by collecting teaching quality scores of residents, using a pre-test, post-test, control group study design. Qualitative data were collected by semi-structured interviews with residents who participated in the educational training programme.

*Results:* No statistically significant differences were found between the total scores on the CTEI of the control, pre-test and post-test study groups. However, estimations of effect size indicated a practical effect of the educational training programme. (post-test Cohen $d = 0.76$) Collected qualitative data supported the indication that the educational course improved the quality of residents' teaching.

*Discussion:* The present study was limited by the relatively small number of participants. One two-day educational training programme is not sufficient to establish a solid improvement in resident's teaching quality. Follow-up one-hour workshops on specific topics, tailored to the learner's needs, are recommended to enhance improvements in residents' teaching.

Starting out as apprenticeship learning, medical education today confronts students with a variety of teachers in different settings, such as hospital wards, outpatient clinic and ward rounds. Previous studies showed that junior doctors and residents provide most clerkship teaching.[1-4] Most of them have not received any professional teacher training. Furthermore, despite willingness to teach and perceived benefits from teaching for their own learning, their primary task remains patient care.[4] Unfortunately, the limited time for teaching is being threatened by increasing pressures to enhance clinical productivity and research output. Nevertheless, effective teaching requires sufficient time for planning, instruction and reflection on the teaching process.[5]

Improvement of clinical teaching quality requires instruments to measure it. Copeland and Hewson presented a generic, discipline-independent, instrument, the Clinical Teaching Effectiveness Instrument.(CTEI)[6] In a previous study we proved the CTEI's suitability for measuring teaching quality provided by surgical staff and residents in undergraduate training in a European setting.[7] In the present study we used CTEI scores to measure improvement in surgical residents' clinical teaching skills after an educational training course. We also elicited residents/junior doctors' views on the effects of this course by asking them: 1) Did you change your educational activities after the educational training course and, if so, in what way? If not, why not? 2) Did you use elements from the educational training programme in professional contacts with other residents?

***Methods***

*Setting and procedure*

This study was performed in the Department of Surgery, VU Medical Center (VUmc), Amsterdam, the Netherlands. This department employs fifteen surgical residents per year. These residents and six junior doctors provide patient care in the clinical wards and the emergency room. Every year, approximately 65 students do their ten-week surgical rotation in the department.

Data collection started in September 2003. All residents and junior doctors were informed in writing about the study. They were assured that anonymity was guaranteed when data were communicated to others than the researchers. The two-day 'Train the trainers' course was run in January and October 2004. Thirteen residents and junior doctors for whom seven or more CTEI ratings had been collected and who would still be working in the department in 2004 were invited to attend the course in January and eight residents and junior doctors who had not received any previous educational training and with seven or more ratings as pre-test data were invited to attend the course in October 2004. No clinical duties were scheduled for participants on course days. Before both courses participants were invited to discuss their CTEI ratings with the first author. CTEI ratings collected between March and May 2004 served as post-test data for participants in the January course and as pre-test data for the

other residents and junior doctors. After both courses, participants were invited for semi-structured interviews about the effectiveness of the course. After the October course post-test data were collected for the course participants and pre-test data for the other residents and junior doctors.

*The Clinical Teaching Effectiveness Instrument (CTEI)*

Table 1 shows the CTEI items. They were translated into Dutch with permission from the authors. All medical students doing their surgical rotation in the study period were asked to complete the CTEI to rate residents/junior doctors teaching quality. Items were rated on a five point Likert scale (Table 1) Students received the questionnaires at the start of the week and returned them at end of the week. They were free to determine when to complete the CTEI, in which setting to evaluate teaching behaviour and which resident or junior doctor to evaluate during that week.

*The 'Train the trainers' course*

In 1996, the Royal College of Surgeons of England (RCSE) developed a two-day training course to improve the standard of teaching in surgical practice.[8] The course was adapted to the Dutch situation and Dutch course trainers were trained. Currently, the course is taught by a clinician and a medical education expert at several locations in the Netherlands, mostly to surgical staff instead of residents. The maximum number of participants is twelve.

Course themes are: understanding of adult learning, providing feedback (micro-teaching), practical skills teaching and assessment. Teaching is interactive, tailored to the clinical setting and participants can discuss any issue that arises during the course. After completion, participants receive a certificate of attendance.

*Semi-structured interview*

Semi-structured interviews are a generally accepted instrument to gather rich qualitative data on well-defined topics. After the course, participants were interviewed about the effectiveness of the course. Interviews were audio-taped and transcribed verbatim. Transcript summaries were mailed to interviewees for approval. The starting questions were: 1) Did you change your educational activities after the 'Train the trainers' course and if so, in what way? If not, why not? 2) Did you use elements of the course in professional contacts with your fellow residents or supervisors?

After reading two randomly selected transcripts, the first author identified, listed and coded themes. The remaining transcripts were coded by the first author (HvdHS) and one of the co-authors (HD) using the themes. Comparison of the results demonstrated minimal differences.

**Table 1:** Mean scores, standard deviations and Effect Size estimations (ES) of residents/ junior doctors per item and in total on the Clinical Teaching Effectiveness Instrument. (1 = never/poor, 2= seldom/mediocre, 3= sometimes/good, 4= often/very good, 5= always/superb)

| | Control | Pre-test | ES pre-test | Post-test | ES post-test |
|---|---|---|---|---|---|
| Establishes a good learning environment | 3.84 ± 0.98 | 4.07 ± 0.52 | 0.23 | 4.32 ± 0.28 | 0.49 |
| Stimulates me to learn independently | 3.97 ± 0.53 | 3.86 ± 0.62 | -0.21 | 4.10 ± 0.31 | 0.25 |
| Allows me autonomy appropriate to my level/ experience/competence | 4.06 ± 0.52 | 4.15 ± 0.42 | 0.17 | 4.45 ± 0.26 | 0.75 |
| Organizes time to allow for both teaching and care giving | 3.70 ± 0.52 | 3.66 ± 0.64 | -0.08 | 3.86 ± 0.29 | 0.33 |
| Offers regular feedback (both positive and negative) | 3.44 ± 0.69 | 3.64 ± 0.63 | 0.29 | 3.91 ± 0.46 | 0.68 |
| Clearly specifies what I am expected to know and do during this training period | 3.39 ± 0.48 | 3.52 ± 0.54 | 0.27 | 3.64 ± 0.43 | 0.52 |
| Adjusts teaching to my needs (experience, competence, interest, etc) | 3.52 ± 0.56 | 3.78 ± 0.60 | 0.46 | 4.09 ± 0.43 | 1.02 |
| Asks questions to promote learning | 3.52 ± 0.54 | 3.76 ± 0.61 | 0.44 | 3.89 ± 0.46 | 0.69 |
| Gives clear explanations/ reasons for opinions, advice, actions, etc | 3.61 ± 0.40 | 3.82 ± 0.48 | 0.53 | 4.11 ± 0.31 | 1.25 |
| Adjusts teaching to diverse settings | 3.35 ± 0.55 | 3.63 ± 0.80 | 0.51 | 4.05 ± 0.39 | 1.27 |
| Coaches me on my clinical/technical skills | 3.46 ± 0.61 | 3.63 ± 0.84 | 0.28 | 4.03 ± 0.45 | 0.93 |
| Incorporates research data and/ or practice guidelines into teaching | 3.22 ± 0.59 | 3.25 ± 0.83 | 0.05 | 3.26 ± 0.77 | 0.07 |
| Teaches diagnostic skills | 3.51 ± 0.49 | 3.63 ± 0.69 | 0.24 | 3.80 ± 0.36 | 0.59 |
| Teaches effective patient and/or family communication skills | 3.07 ± 0.57 | 3.24 ± 0.83 | 0.30 | 3.13 ± 0.81 | 0.11 |
| Teaches principles of cost-appropriate care (resource utilization, etc) | 2.54 ± 0.74 | 2.55 ± 0.80 | 0.01 | 2.40 ± 0.73 | -0.19 |
| Total score | 3.55 ± 0.41 | 3.67 ± 0.55 | 0.29 | 3.86 ± 0.33 | 0.76 |

*Statistical analysis*

Three groups of data were distinguished: 1) pre-test data of course participants 2) post-test data of course participants 3) control data of non-participants. Means and standard deviations were calculated for each resident/junior doctor in each group. Effect sizes (Cohen's *d*) were estimated to determine a course effect on overall teaching effectiveness. Effect size quantifies the importance of results, regardless of the size of the study sample.[9] Effect sizes were defined as: "small, negligible practical importance, $d \approx 0.2$ "; "medium, moderate practical importance, $d \approx 0.50$"; "large, crucial practical importance, $d \approx 0.80$."

A Mann Whitney Test was used to compare the three groups. $p<0.05$ was considered significant.

***Results***

Thirteen residents/junior doctors were invited to attend the 'Train the trainers' course in January 2004. Three residents and one junior doctor failed to attend because of on call duties (2), changing hospitals (1) and illness (1), leaving nine participants. Of the eight residents invited for the course in October 2004, two did not attend due to on call duties (1) and vacation (1). The control data set contained 84 ratings of 13 residents/junior doctors. The pre-test data set contained 106 ratings of 15 course participants. The post-test data set contained 91 ratings of 13 participants, because two residents had moved to other departments.

*Discussions of pre-test scores*

Fifteen prospective course participants were invited to discuss their pre-test scores. The majority were very interested in the descriptions of the CTEI items, which were new to them. They all admitted not knowing much about principles of cost-appropriate care. None of the junior doctors was involved in research and they admitted not incorporating research data into their clinical teaching. All received a copy of their score.

*Ratings of teaching qualities*

In general, residents/junior doctors' overall teaching qualities were rated positively. Table 1 shows mean scores, standard deviations and Effect size Estimations (ES) per CTEI item and for overall CTEI scores per study group. Mean scores were 3.55 (SD=0.41) and 3.67 (SD=0.55) for the control group and the pre-test group, respectively. Post-test ratings were slightly better, i.e. 3.86 (SD=0.33). Differences between the post-test group and the control group (p=0.11) and between the pre-test group and the post-test group (p=0.39) were not significant. Effect size estimation of the control group versus the post-test group reached almost 0.80. Item means varied from 2.54 to 4.06 in the control group and from 2.55 to 4.15 in the pre-test group (Table 1). Estimations of item effect sizes between the control group and the pre-test group ranged from –0.21 to 0.53, suggesting a moderate effect for the items: 'gives clear explanations/ reasons for opinions, advice, actions' and 'adjusts teaching to diverse settings'.

The differences between the total scores of the control group and the pre-test group were not significant. (p = 0.65). No effect was found between the pre-test group and the control group (ES =0.29).
In the post-test group, item means varied from 2.40 to 4.45. Estimations of item effect sizes between the post-test group and the control group ranged from –0.19 to 1.27. The effect sizes indicated crucial practical importance (ES > 0.80) for the items: 'adjusts teaching to my needs', 'gives clear explanations/ reasons for opinion/ advice/actions', adjusts teaching to diverse settings' and 'coaches me on my clinical/ technical skills'.

*The semi-structured interviews*
Of thirteen course participants, eleven were interviewed two to three months after the course. Two had moved to another hospital. Interview outcomes were categorised as: 1) changes in teaching behaviour; 2) effects of changes in teaching behaviour on student performance; 3) effects of changes in teaching behaviour on personal learning. These themes are illustrated by quotations from the interviews.

*Changes in teaching behaviour*
All interviewees said their teaching behaviour had changed due to increased awareness of their teaching role. Three residents reported raised awareness of this role due to feedback on pre-test ratings.

> *I've become more aware of my teaching task. I'm trying to find more time for teaching.*

The main change in teaching behaviour was increased questioning of students about mutual expectations regarding the upcoming day/night/week and about clinical reasoning.

> *I talk more with students. The course made me see that students like the occasional challenge. It stimulates their learning and that's what I'm doing more often now. I'm throwing more questions at them.*

In the 'Train the trainers' course, participants learned about the four-step approach to skill training. Step1: a silent run by the teacher, observed by the student. Step 2: teacher performs skill explaining each step of the skill. Step 3: teacher performs skill while the student tells the teacher stepwise what to do. Step 4: student performs the skill explaining each step to the teacher. Eight out of eleven participants did not use this approach because they thought is was not feasible in undergraduate clinical training.

*It's not realistic. You cannot remove an appendix three times in a row.*

Two residents reported using the approach in their own learning in a set of similar surgical interventions, with one resident supervising the other. Both felt comfortable with the approach.
In microteaching sessions, giving and receiving feedback was practised intensively. Five interviewees spontaneously mentioned qualitative and quantitative improvement in giving feedback to students. They felt more inclined to provide positive written and verbal feedback.

*Now, I always try to write something on the assessment form, something positive and something that needs attention.*

Opportunities for feedback seemed to depend on the clinical setting. Residents/ junior doctors in wards with high patient turnover and in busy outpatient clinics did not report improved feedback.
Four residents said they got more enjoyment from teaching after the course.

*Giving feedback, really sitting down for that after a busy clinic? No, that just doesn't happen. Things are always very hectic. And then it's half past four and lots of things still need doing. And students ... well, they also want to go home as quickly as possible.*

*Effects of changes in teaching behaviour on students' performance*
Residents/ junior doctors said improvement in students' performance was difficult to detect, because of the short duration of the surgical clerkship. They all said that teamwork improved from more attention for student learning. They thought that structuring learning by explaining objectives more clearly to students made students feel accepted as members of the medical team. This fostered a positive educational climate and students' active involvement in patient care.

*I'm more aware that some students need help to cross a certain threshold. By asking more of them, by challenging them and by explaining more of the whys behind certain things, you can get them really excited about the work. When that happens, it's much more enjoyable for me as well.*

When you explain to them that in vascular surgery they should know certain things, you find they really go and look things up. You find that you benefit from that as well. They have a better understanding of what sort of patients there are on the ward and what's important to them. I think that's very useful for them.

Seven residents/ junior doctors spontaneously mentioned that they felt ill-equipped to teach underperforming students.

> *I've practised, but the only thing that keeps bothering me are people who are just not doing well ….*
>
> *Sometimes I think like 'lost cause'. Of course that's not right. But I just cannot help thinking; phew, do I really have to put all my energy into that?*

*Effects on personal learning.*
It was a real eye opener for all participants when their own role as a learner was discussed in the course. It emerged that they did not always have a clear idea of the learning objectives of their own rotations.

> *There were moments when I thought: hey, this is also important for me! That you should find out what's expected of you. That you are responsible for you own education. That it's up to you to take action.*

Five residents reported having asked to be taught surgical procedures according to the four-step method. They all felt comfortable with this approach and said they had learned a lot, although the approach was time consuming. Two residents mentioned that not all supervisors were familiar with the approach.

*I used the four step approach. It worked really well. I find that when I'm watching someone who is not using it, I try to recite the steps in my head, although the other person isn't saying anything. Not everybody has time to use this method or is familiar with it.*

A micro-teaching session dealt extensively with the rules for providing and receiving feedback and its function and impact on learning. However, none of the participants gave more feedback to colleagues after the course. Reasons they gave for this were: not feeling safe, not feeling competent enough and it not being customary to give feedback to colleagues.

*Giving feedback is rather a sensitive issue … most colleagues are not all that open to it. And then I find it difficult to say something.*

*I'm often tempted to give feedback … Nevertheless, you feel that it's not really your place to do so. Funny really.*

All participants were highly appreciative of the course. They said the best timing of the course was in the second or third year of residency training. In the first year residents need all their time and energy for patient care.

## Discussion

We examined whether a two-day educational training programme was successful in making residents/junior doctors more effective teachers of surgical clerks. Previous studies showed improved teaching qualities after residents-as-teacher curricula in Objective Structured Teaching Exams or post-course evaluations.[10-14] In the present study, we also explored the actual performance of residents and junior doctors as teachers in the clinical setting.

A limitation of the present study is the small number of participants, although the number of participants was realistic and feasible in the daily routine of a department in an academic hospital. Although effect size estimations of the impact of the course suggested a moderate to large practical importance (Cohen $d = 0.76$), no statistically significant differences were found to support this effect. Decreased standard deviations in the post-test group (table 1) suggest that residents/ junior doctors who performed less well as teachers benefited from the course. The lack of significant differences may be explained by a mismatch between course content and CTEI item content. The course paid little attention to the incorporation of research or guidelines in teaching, patient and family communication skills and principles of cost-appropriate care.

The CTEI items on these issues yielded strikingly higher standard deviations compared with other CTEI items in the post-test group. The effect sizes also indicated a negligible course effect in these areas. To remedy gaps in course content, supplementary workshops on selected topics might be useful. Studies have identified key content for teach the teachers curricula.[13,15] Assessing trainees' learning needs seems to be particularly important. Other studies suggested scheduling workshops during lunch hours to ensure minimal disruption of residents' clinical work and modest costs.[13]

Course participants unanimously reported enhanced awareness of their role as teachers after the course. They felt challenged to reconsider their attitudes and orientation towards education. Three residents reported this effect from discussing pre-test ratings also. The major change in teaching behaviours was increased questioning of students about learning objectives, mutual expectations and clinical reasoning. Active questioning is known to stimulate learning and it was an important course topic.

The four-step approach to clinical skills training seems more suited for residents own learning than for clerkship teaching, probably due to the relatively brief working relationship of students and residents, which reduces the likelihood of repeated occurrence of similar procedures necessary to use the approach. The more lengthy collaboration during residency training offers more opportunities for rehearsal. The four-step approach in undergraduate clinical training will require further consideration.

Half of the interviewees reported an increase in the quality and quantity of providing feedback, with emphasis on positive feedback. Residents in busy clinical settings reported a lack of time for feedback despite the strong emphasis on 'feedback as a stimulus towards learning' in the course. This confirms findings that time constraints and conflicting priorities are obstacles to good teaching.[16] Therefore we strongly recommend protected teaching time, especially in busy clinical settings.

Interestingly, seven out of eleven residents spontaneously mentioned feeling ill equipped to effectively teach underperforming students. This is worrisome. It may lead to underperforming students 'slipping through', because residents, due to feelings of inadequacy, give up on teaching them and give them a pass because they don't know how to judge them. This strongly suggests that teaching of underperforming students should be included in workshops on teaching.

Although the realisation that they themselves were also learners was a real eye opener for residents, newly acquired teaching skills were not incorporated into their own learning agendas, except for the four-step approach. Despite agreeing that feedback skills should be used more often in day-to-day practice, residents indicated that feelings of inadequacy, not feeling safe and lack of acceptance of feedback among colleagues prevented them from actually using these skills. This suggests the need to foster an educational climate in which feedback is an accepted tool for trainees and supervisors to enhances learning. Educational training programmes for residents and clinical staff might contribute to such a positive educational

climate.

Residents advocated a teaching course in the second year of residency. Others have suggested the same.[13]

Although this study failed to demonstrate significant improvements in residents/ junior doctors teaching qualities following a two-day 'Train the trainers' course, effect sizes and qualitative data suggest that such a course might be of practical importance in the surgical department. In a prospective study we will investigate whether significant improvements in teaching quality can be achieved by including more participants in the study groups.

One single two-day course may not suffice to achieve a solid improvement in residents' teaching qualities. Additional one-hour workshops on selected topics, tailored to learners' needs may improve results. Undergraduate medical students must be taught well and have good role models to emulate. Ultimately, medical educators will need to know whether improving residents' teaching skills will improve patient care outcomes. Hopefully, this study has contributed to answering this important, but very complicated, research question.

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# CHAPTER 7

# DISCUSSION

Clerkships are generally seen as a decisive part of medical training in which students refine and complete their knowledge, clinical skills and attitudes in relation to real patients in an authentic professional clinical context.[1] Clerkships comprise approximately one third of medical students clinical training. Although, apprenticeship learning in the strictest sense is no longer feasible, undergraduate clinical training is still offered to relatively small groups of students. This means that clerkship training is a cost intensive component of medical education.[2]

Since 1765, five major curricular reform movements have catalysed significant changes in medical education. However, these changes were mostly limited to preclinical medical education.[3] Form and content of clinical clerkships have remained relatively untouched by reforms. The learning processes that occur during clerkships as well as the determinants and outcomes of clerkship learning continue to be incompletely understood and little studied.[4]

Today, various societal factors conspire to heighten the demand for doctors. An ageing population requires comprehensive care for multiple, often chronic illnesses; doctors' personal life choices introduce a tendency towards a reduction in the number of working hours and the increasing number of female doctors also means that the size of the workforce must increase to meet the demand for medical care.[5,6] Society is exerting pressure on medical schools to admit more and more students.[7] The concomitant increased influx of clinical clerks in the wards and outpatient clinics will inevitably make higher demands on the qualitative and quantitative effectiveness of the learning environment of clerkships. Quantitative output of education must not be heightened at the expense of educational quality. Despite increasing numbers of students, the available time for clerkship training remains limited due to societal demand for high educational output forcing medical schools to guide their students towards graduation within a fixed period of time. In summary, medical schools are faced with the challenge to provide a learning environment that is both effective and efficient. This can only be achieved when we acknowledge that clerkships merit serious educational attention and act accordingly.

In this thesis we addressed two main research questions. Firstly, we systematically explored qualitative and quantitative educational features of a traditional clerkship. Form and content were disentangled in quantitative investigations of learning objectives attained, clinical skills performed, time spent on different activities and the amount of supervision and feedback provided. Qualitative information on clerkship learning was obtained from student focus groups. Secondly, interventions aimed at improving format and content of learning were investigated in a traditional clerkship and an existing instrument with proven measurement qualities was used to measure the teaching qualities of clerkship teachers to determine any improvement after interventions.

Not surprisingly, the outcomes of our studies demonstrated that there is no panacea that will miraculously create the ideal learning environment. The studies we conducted to answer our research questions revealed three crucial factors for an effective and efficient learning environment in clerkships. These factors are: structure and management of clerkships; students' contributions to clerkship learning, and clerkship teachers.

***Structure and management***

This thesis has shown that learning in a traditional, unstructured clerkship is a haphazard process, with "educational exposure" varying substantially from student to student. Almost

one quarter of students reported that their ability to analyse and manage emergency patient problems was inadequate or moderate. This is cause for serious concern seeing that emergency problems constitute an important and basic part of medical performance. Although it is difficult to determine the required frequency of skill performance for attaining adequate performance levels, the performance rates of diagnostic/therapeutic skills revealed by our studies were obviously inadequate by any standard. Less than half of diagnostic/ therapeutic skills were performed more than three times in the course of a clerkship. Students were rarely observed by clinical staff or residents while taking a history or doing a physical examination. Lack of observation is inevitably accompanied by a lack of constructive immediate feedback. Feedback was mostly provided by residents. It seems questionable whether residents are fully competent to provide adequate feedback on all activities students must undertake to progress in their learning.[8] Faculty staff, residents and other healthcare professionals might collaborate in observing and giving feedback on those activities where feedback is prerequisite for effective student learning.

A striking finding with regard to educational efficiency was that students spent a good deal of their time doing activities with limited learning value and waiting for certain activities to happen. Moreover, the intended curriculum did not match the actual curriculum. Restructuring a ten-week surgical clerkship by introducing a logbook with learning objectives supplemented by pre-coded checklists for obligatory structured assessments, direct observations and structured feedback yielded only slight improvements. This short-term multifaceted intervention was not effective in enhancing the learning effectiveness of this clinical clerkship. Further research might focus on multifaceted interventions over a longer period of time and in more than one clerkship rotation. In addition, it seems advisable to determine whether all stakeholders actually endorse and apply restructured educational formats. The results of our study suggested that not all participants actually implemented the new educational methods. Educational audit, evaluating the starting points of restructured courses, seems indicated. When such an educational audit is performed, frequent communication with all those involved about the outcomes of these evaluations may foster a shared positive attitude towards clerkship teaching and create a solid foundation for lasting change to achieve a satisfactory educational structure of clerkships. Furthermore, an effective learning environment requires an appropriate balance between 'learning' and 'working', a balance that should be recognised and adhered to by all stakeholders.

***Students***

According to the students, the strongest stimulus for effective learning was active participation in clinical care followed by constructive feedback. However, students were not routinely invited to actively engage in clinical care. They spent much of their time observing others performing clinical activities, such as their supervisors or while assisting in theatre with only limited information about patients' problems. Feedback was not automatically provided to students and some students were reluctant to ask questions for fear of being exposed as incompetent. The educational climate in a clerkship should be conducive to effective clinical learning. It may be helpful to teach students certain communication and management skills that will help them to secure their personal learning agenda as well as active involvement in clinical work and constructive feedback. Although good teachers make an essential contribution to medical education, the ultimate responsibility for learning has always rested with the students. Students should be made more aware that they are responsible for their own learning and

should be encouraged to act accordingly. It seems doubtful whether students can obtain the maximum profit from a clerkship when they do not activate prior theoretical knowledge before embarking on clinical work.
Whereas increasing the "throughput" of patients may be beneficial to the financial balance sheets of academic medical centres and teaching hospitals, it has an erosive effect on the clinical learning environment by limiting the time that can be spent with patients.[9] Students and house officers have complained that loss of time with patients has been deleterious to their education.[10] Therefore protected time for self-study in clinical clerkships is recommended to enable students to prepare for patient encounters so that, despite time constraints, they can derive the maximum benefit from these contacts. Self-study could be stimulated by some form of assessment just before or in the first weeks of a clerkship. It has been shown that scheduled assessment has a positive effect on the learning of students.[11]

***Educators***
Students learn from physicians who enjoy their professional work and provide high quality care. Students have very clear ideas about the educational quality of their teachers.[12] Not all teachers are in possession of the appropriate teaching skills. This is worrying, since learning experiences largely depend on individual clinicians' educational qualities.[12] This thesis has shown that clinical education is largely left to residents. It is questionable whether supervision and feedback, the didactic core of apprenticeship learning, should be delegated to this group of relatively inexperienced educators. Junior residents in particular are highly preoccupied with their own learning in patient care and are hard pressed for sufficient time to adequately perform the time-consuming task of providing proper supervision and feedback to undergraduate students. If we choose to entrust the bulk of clinical education in clerkships to residents, we must plan protected teaching time in residents' work schedules in patient care. Time is of the essence in the process of medical education. Protected time is not only needed for learners to learn effectively, but also for teachers to offer quality teaching.[9]
Medical teachers can and should be trained to become better teachers. The content of educational training programmes should be tailored to the clinical settings in which teachers perform their educational tasks. As stated before, residents play an important part in clinical education. Over time most residents will become staff members in various hospitals. To enhance professionalism in clinical education, it is recommended to incorporate a compulsory module on medical education in residency training.[13] This bottom-up strategy for clinical teacher training will pay off in the near future by providing hospitals with clinical staff equipped with educational expertise. In view of the impending population explosion in our medical schools and clinical clerkships, it seems realistic to assume that more hospitals will have to be involved in clerkship training besides academic hospitals and affiliated teaching hospitals.
Merely offering educational training programmes to staff and/ or residents is no guarantee that the quality of clerkship teaching will actually improve. Good clinical teaching is time-consuming and labour intensive. It encroaches on the available time for research and patient care. Faculty members are mostly rewarded for financial "productivity" in research and, recently also, patient care by promotions, higher salaries or both.[14] Similar incentives should be offered to promote and reward good teaching. Teachers should be more aware of their important role in creating a positive learning environment. They can provide strong positive stimuli for active learning by clinical students, for instance by actively involving students in

clinical work, by responding appropriately to the educational needs of clerks, by creating a climate in which clerks feel free to ask questions, and by reflecting on their own and students' clinical activities and experiences.

***Perspectives***

Research on the effectiveness of Continuing Medical Education (CME) showed the potential effectiveness of multifaceted approaches.[15] From the results of the study described in chapter 3 we concluded that simultaneous introduction of several interventions yielded a slight improvement in the educational effectiveness of a surgical clerkship. It may be worthwhile to investigate the effectiveness of multifaceted approaches to improve structure and management of clerkships when they are sustained for a longer period of time and in more than one clerkship. Direct observation followed by feedback should be firmly embedded in the routine educational programme of clerkships. Direct observation of students followed by feedback should increase during clerkships, covering all clinical activities students perform. Currently, direct observation is prone to fall victim to teachers' lack of time. It would be worthwhile to develop a less time-consuming procedure for direct observation that is feasible in wards and outpatient clinics. Such a procedure may be more acceptable to teachers and therefore be used more frequently. Besides clinical staff and residents, other health care workers, students, and even patients might participate in direct observation and feedback.[16,17] It is possible to teach teachers how to provide constructive feedback in a fixed, short period of time. Offering teachers micro-teaching training programmes for such skills might make it feasible to increase the frequency of direct observations including feedback. Moreover, efforts should be made to create an educational culture in the learning environment of clerkships that makes all those involved recognise the importance of observation and feedback. As for the students' role in learning, it may be helpful to teach them certain communication and management skills in order to help them secure their personal learning agenda. Several specialties in the Netherlands have adopted the CanMeds 2000 model to guide residency training. CanMeds 2000 describes the objectives for specialist training programmes by defining seven roles and related competencies, to be achieved at the end of the training programme.[18] One of these roles is that of the 'scholar', who should be competent to develop, implement and document a personal education strategy. In order to achieve a smooth transition from undergraduate medical education to residency training, it seems worthwhile to adapt the CanMeds 2000 objectives for undergraduate medical education. When students are prepared at an early stage of medical training for their role as 'scholar,' they are likely to be more aware of their own responsibility for their personal learning agendas. Medical schools should allow students to follow their personal learning agendas instead of forcing them to adhere to a highly prescribed programme. An essential competency that should be taught to empower students to develop, construct, and implement their personal educational strategies might well be the ability to reflect on learning encounters before, during and after the interaction, either alone or with peers or supervisors. In addition to feedback, reflection is regarded as an important stimulus for learning.[19] Students may become more competent in using certain learning strategies to improve the effectiveness of learning in preclinical and clinical settings alike. With respect to teachers in clinical learning environments, it would be worthwhile to take steps to improve educational professionalism for both staff member and residents. Staff and residents should be made more aware of their important role in creating an effective learning environment.

Teachers should be offered the educational tools to successfully perform their teaching tasks and to achieve a workable balance between teaching, patient care and/or research.
In conclusion, this thesis explored quantitative and qualitative educational elements of a surgical clerkship in order to pinpoint what might be valuable contributions to an effective and efficient learning environment.
Educational interventions within an existing structure were evaluated. The resulting recommendations for present and future medical education and educational research are extensively discussed. .The results show that there is still a long way to go before we will fully understand what is going on in the black box of clerkship learning and which interventions will bring about an effective and efficient learning environment. The results of interventions in a dynamic learning environment such as a clinical clerkship are not easy to predict due to the multitude of variables affecting outcomes. Learning in a clinical clerkship is more complex than we are perhaps inclined to think. Further research, comparing present clinical clerkships with those in which interventions are introduced, is strongly recommended. We hope that this thesis will be an impetus for more research to shed more light on the learning environment of clerkships.

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# CHAPTER 8

# SUMMARY

The aim of this thesis was to shine some light on the contents of the educational black box of clerkship learning by unravelling key educational elements of the clinical learning environment to reveal ways of improving undergraduate clinical training. In addition, we prospectively evaluated several educational modifications of clerkships to determine whether they led to significant educational improvements.

In **Chapter 1** we present the relevant literature in relation to the topics of this thesis and we outline our research questions. The first research question we addressed is how the learning environment of a traditional clerkship is best described. The second question asks whether the educational effectiveness of a clinical clerkship can be improved by interventions in the learning environment or by interventions directed at staff-educators.

In **Chapter 2** we present a study into the learning environment of a traditional clerkship. On the last day of their surgical rotation students completed a questionnaire consisting of 116 items on five dimensions related to the educational quality of their clerkship experiences. The five dimensions concerned: learning objectives, patient problems encountered, clinical skills performed, feedback received, and time spent on different activities.
Ninety percent of the students thought the learning objectives were clear at the start of the surgical rotation and appeared easy to attain. The results concerning the patient problems encountered by students suggest a wide variety in individual students experiences. In general, students encountered few emergency patient problems. The frequency of diagnostic and therapeutic skill performance varied hugely among students. Feedback was mostly provided by residents and not so much by faculty staff. Observation of history taking and physcial examination and subsequent feedback on performance were both rare occurrences. Students stated unanimously that overall individual feedback was limited to less than one hour per week. Almost 80% of the students reported spending more than three hours per week on activities whose learning value was limited, including chores like searching for X-rays and collecting blood samples. The conclusion was that learning in a traditional clerkship is best characterised as haphazard and that students have widely varying experiences. Efficiency gains would be possible when students could use their time as efficiently as possible.

**Chapter 3** presents a study in which we addressed the impact on the educational effectiveness of a clerkship as a result of interventions in the learning environment. In a prospective study we compared student evaluations of a traditional surgical clerkship with those of a restructured surgical clerkship at the same location. In this way we were able to ascertain the impact of a multifaceted approach involving simultaneous introduction of several interventions aimed at increasing the learning effectiveness of a surgical rotation. The interventions comprised: a student logbook with pre-coded checklists for obligatory structured assessments, direct observation, and structured feedback. Two consecutive cohorts of surgical clerks were

surveyed on their last day of the surgical rotation. The first cohort undertook the traditional clerkship and the second cohort the restructured clerkship. The questionnaire consisted of 82 items measuring five dimensions of educational quality, i.e. the learning objectives, core patient problems encountered, core clinical skills performed, feedback received and time spent on various activities. The only significant differences between the two cohorts proved to be those between direct observation of diagnostic/ therapeutic skill performance and time allocation. Although at the end of the restructured clerkship a higher percentage of students reported being never or rarely observed while performing clinical skills, they also reported spending more time performing those skills and less time on activities of limited educational value compared with the students in the traditional clerkship. Overall, the quality indicators did not differ between the two cohorts. Appartently, a short-term multifaceted intervention was not sufficient to enhance the learning effectiveness of the surgical clerkship.

**Chapter 4** deals with the effects of interventions in the learning environment of a clerkship. We explored the educational quality of undergraduate clinical training and possibilities for improvement by conducting focus group interviews among students who had recently finished their surgical rotation. Some of the students had experienced the clerkship in the academic hospital where structured teaching components had recently been introduced and other students had experienced mostly unstructured clerkships in one of the affiliated hospitals. The questions discussed were: a) Which learning experiences contributed most to students' learning during clerkship? b) What did the students think of the recently introduced structured educational components in the clerkship in the academic hospital?
Positive learning experiences mentioned by the students were hospital staff observing and providing feedback on students clinical activities. The students responded positively to the structured components of the clerkship in which observation and feedback featured prominently. Despite the intervention all students said that observation of clinical activities and feedback were rare phenomena. The students had clear ideas about good quality teaching. They said that learning was enhanced when they were actively involved in clinical work, such as being asked questions about patient problems, being able to see a patient before staff did, preparation for operations, and interactive lectures. Students reported that most feedback was provided by residents. They perceived a difference between feedback from junior and senior residents, with junior residents paying hardly any attention to their clinical activities and thus failing to provide feedback. Not all students perceived the learning environment as encouraging and positive. Several students said they were reluctant to ask questions for fear of being seen to be incompetent. Students said that the general surgical knowledge they had gained prior to the clerkship should have been activated on entering the rotation. However, perceived lack of time resulted in students not studying until the last few weeks before their final surgical exam.
The results of this study revealed which learning experiences contributed to the learning of

students. The measures to improve the educational structure of the clerkship seemed to pay off and the results pointed to a trend towards further improvements.

**Chapter 5** deals with the possibility of increasing the learning effectiveness of clinical clerkship by interventions targeted at staff-educators. Before actually evaluating the results of interventions we needed to find a reliable and valid instrument to measure teaching quality of individual teachers as well as groups of teachers. The outcomes obtained with such an instrument can be used for feedback and remedial purposes for clinical teachers. We tested the Clinical Teaching Effectiveness Instrument (CTEI), an instrument developed and validated by Copeland and Hewson in a training programme in the USA and consisting of 15 indicators of teaching effectiveness to be rated on a five point Likert scale. The 15 indicators were derived from theoretical study and empirical qualitative verification. This instrument was translated into Dutch with permission from the authors.
The first research question we wanted to answer was how many repeated ratings by different students were needed to achieve a reliable rating of individual educators.The second research question asked about the number of ratings, educators and raters needed to obtain reliable information about a group of educators. Surgical clerks were asked to fill in an anonymous questionnaire, consisting of the 15 teaching effectiveness indicators. Every week students were asked to choose a resident and a staff member to be judged using the CTEI questionnaire. Students were free to choose in which teaching setting they evaluated the teachers' clinical teaching behaviour.
The results showed no statistically significant differences between staff and residents.The largest variance component was associated with rater variance. The translated CTEI proved to be a reliable instrument for rating teaching quality of staff and residents. Seven ratings or more were sufficient to obtain a reliable individual score interpretation and 15 teachers or more, with a single rater per teacher, were sufficient for reliable group scores. With two ratings per educator, 10 educators per group sufficed. This study showed that the CTEI yielded reliable findings with feasible sample sizes.

**Chapter 6** addresses the question whether educational training and feedback improve the quality of teaching by surgical residents. Students were asked to rate a student-teacher encounter with a resident/ junior doctor, using the Clinical Teaching Effectiveness Instrument (CTEI), which the previous study have proved to a reliable instrument for use in a European undergraduate clerkship setting. Fifteen residents/ junior doctors participated in a two-day educational training programme. As quantitative outcome measures we collected students' CTEI ratings of residents teaching quality in a pre-test, post-test, control group study design. Before attending the course the prospective participants were invited to a confidential discussion of their CTEI ratings. Qualitative data were collected by semi-structured interviews with course participants after the course. No statistically significant differences were found

between the overall CTEI ratings of the control, pre-test and post-test study groups. However, estimations of effect sizes suggested a practical effect of the educational training programme (post-test Cohen $d$ = 0.76). The qualitative data supported the indication that the course improved the quality of residents' teaching. This study was limited by the relatively small number of course participants. The results showed that a two-day training programme was not sufficient to achieve a solid improvement in residents' teaching skills. Follow-up one-hour workshops on selected topics, tailored to learners' needs, are recommended to improve residents' teaching.

In **chapter 7** the results of the studies described in chapters 2-6 are dicussed in relation to the the relevant literature. Perspectives for future research are delineated.

# CHAPTER 9

# SAMENVATTING IN HET NEDERLANDS

Het doel van dit proefschrift is om een beter inzicht te krijgen in de leeromgeving van een co-assistentschap en elementen te identificeren die bijdragen tot een stimulerende leeromgeving waarin een co-assistent in staat wordt gesteld zo effectief mogelijk te leren. Een co-assistentschap is wel eens omschreven als een zogenaamde "black box". Wat er tijdens de periode van het co-assistentschap precies gebeurt met betrekking tot het leren van de co-assistent blijft duister: leert hij/ zij juist die dingen, die voor een basisarts van belang zijn?; in voldoende mate?; welke onderwijsmomenten zijn het meest leerzaam?; welke onderwijskundige elementen dragen bij aan het leren van een co-assistent?
Dit proefschrift probeert een antwoord te geven op de vraag welke elementen van het co-assistentschap een positieve bijdrage leveren aan de effectiviteit van leren van co-assistenten en welke niet. Voorts worden interventies in de leeromgeving beschreven, welke het zo effectief mogelijk leren van co-assistenten zouden kunnen ondersteunen.

**Hoofdstuk 1** plaatst de onderzoeksvragen van dit proefschrift binnen het kader van de huidige inzichten in de medisch onderwijskundige internationale literatuur. De eerste onderzoeksvraag richtte zich op de leeromgeving van een, nog steeds veel gehanteerd, nauwelijks gestructureerd, traditioneel co-assistentschap: hoe kan de leeromgeving van een traditioneel co-schap worden omschreven? De tweede onderzoeksvraag richtte zich op de effecten van interventies, enerzijds in de leeromgeving zelf, anderzijds gericht op de docenten in de leeromgeving van een co-assistentschap.

In **Hoofdstuk 2** werd onderzocht hoe de leeromgeving van een traditioneel co-assistentschap kan worden omschreven. Om laatstgenoemde vraag te kunnen beantwoorden werd een vragenlijst geconstrueerd, bestaande uit 116 items verdeeld over 5 kwaliteitsindicatoren, die op grond van hedendaagse inzichten van belang worden geacht voor de onderwijskundige kwaliteit van een co-assistentschap. De vijf kwaliteitsindicatoren waren: leerdoelen, patiëntenproblemen, diagnostische en therapeutische vaardigheden, feedback en tijdsbesteding van co-assistenten. De vragenlijst werd op de laatste dag van het co-schap aan de co-assistent uitgereikt met het verzoek deze in te vullen en te retourneren. Meer dan 90% van de ondervraagde co-assistenten was van mening dat de leerdoelen hen reeds bij aanvang van het co-schap duidelijk waren. Co-assistenten achtten deze leerdoelen eveneens goed haalbaar tijdens het co-assistentschap. De resultaten betreffende de vermeende bereikte kennis ten aanzien van de verschillende patiëntproblemen suggereren een grote mate van individuele verschillen tussen co-assistenten. In het algemeen voelden co-assistenten zich minder competent wat betreft analyse en behandelen van "acute" patiëntenproblemen, zoals bijvoorbeeld "bewusteloosheid". Een minder frequente klinische expositie aan "acute" patiëntproblemen was hiervan mogelijk een oorzaak. Het aantal keren dat een co-assistent een diagnostische dan wel therapeutische vaardigheid uitvoerde verschilde sterk tussen co-assistenten onderling. De ene co-assistent voerde vaker een bepaalde diagnostische/

therapeutische vaardigheid uit dan de andere co-assistent. Co-assistenten gaven aan vaker feedback te ontvangen van een arts-assistent dan van een staflid. Co-assistenten schatten de gemiddelde tijdsduur waarin zij persoonlijk feedback ontvingen op minder dan 1 uur per week. Zelden werd een patiëntencontact, waarbij de co-assistent de anamnese afnam en het lichamelijk onderzoek uitvoerde, geobserveerd. Bijna 80% van de co-assistenten gaven aan dat zij meer dan 3 uur per week besteedden aan zogenaamd "kluswerk", zoals bloedprikken, foto's zoeken et cetera. Concluderend zijn de leerervaringen van een co-assistent tijdens een traditioneel co-schap in hoge mate afhankelijk van het toeval. Leerervaringen van co-assistenten onderling verschillen. Leren tijdens een co-schap zou efficiënter kunnen zijn als co-assistenten vaker worden geobserveerd, vaker constructieve feedback ontvangen en minder tijd besteden aan kluswerk.

In **hoofdstuk 3** werd onderzocht of de effectiviteit van leren tijdens een co-assistentschap kon worden verbeterd door te interveniëren in de leeromgeving zelf. Studentevaluaties van een opeenvolgend cohort co-assistenten in een traditioneel co-schap werden vergeleken met evaluaties van een cohort co-assistenten, die op dezelfde locatie een gereorganiseerd, meer gestructureerd, co-schap volgden. Beide cohorten volgden een co-schap van 10 weken. In vergelijking met het traditionele co-assistentschap werden in het gereorganiseerde co-schap meerdere gestructureerde veranderingen gelijktijdig ingevoerd, te weten: introductie van een logboek, meerdere verplichte toetsen met geprecodeerde scorelijsten, directe observatie en gestructureerde feedback.
Aan de twee cohorten co-assistenten werd gevraagd een vragenlijst in te vullen op de laatste dag van hun co-schap. Cohort 1 volgde een traditioneel co-assistentschap en cohort 2 een gereorganiseerd, meer gestructureerd co-schap. De vragenlijst bestond uit 82 items, verdeeld over 5 kwaliteitsindicatoren welke relevant geacht worden voor de onderwijskundige kwaliteit van een co-assistentschap: leerdoelen, patiëntprobleem, diagnostische en therapeutische vaardigheden, feedback en tijdsbesteding van co-assistenten.
De resultaten toonden een significant verschil tussen cohort 1 en cohort 2 wat betreft directe observatie van diagnostische/therapeutische vaardigheden. Een significant hoger percentage co-assistenten van cohort 2 gaf aan zelden of nooit geobserveerd te zijn tijdens het uitvoeren van een diagnostische/ therapeutische vaardigheid in vergelijking met hun collegae van een traditioneel co-schap. Co-assistenten van een gereorganiseerd co-schap besteedden echter significant meer tijd aan het zelf uitvoeren van een klinische vaardigheid ten opzichte van de co-assistenten uit een traditioneel co-schap. Voorts toonden de resultaten toonden een significant verschil tussen cohort 1 en 2 wat betreft de tijd besteed aan zogenaamd "kluswerk". Co-assistenten van het gereorganiseerde co-schap besteedden significant minder tijd aan "kluswerk". Over het algemeen verschilden de meningen van co-assistenten aangaande de 5 kwaliteitsindicatoren, welke relevant geacht worden voor de onderwijskundige kwaliteit van een co-schap, nauwelijks tussen cohort 1 en cohort 2. Er werd geconcludeerd dat een periode

van 10 weken, waarin meerdere gestructureerde veranderingen tegelijkertijd in het co-schap zijn geïntroduceerd, te kort is om een daadwerkelijke verbetering van de effectiviteit van leren tijdens een co-schap te kunnen vaststellen.

**Hoofdstuk 4** richtte zich nogmaals op de vraag of de effectiviteit van leren tijdens een co-assistentschap kan verbeteren door te interveniëren in de leeromgeving zelf. Co-assistenten, die recent hun co-assistentschap chirurgie met goed gevolg hadden afgesloten, werden uitgenodigd deel te nemen aan een focusgroep. Een deel van de focusgroep deelnemers volgde het co-schap chirurgie in het academisch ziekenhuis, alwaar een gestructureerd co-schap werd aangeboden. Het andere deel van de deelnemers aan de focusgroep volgde het co-assistentschap in een, aan het academisch ziekenhuis gelieerde, perifere kliniek, alwaar een traditioneel, minder gestructureerd, co-schap werd gevolgd. De volgende twee vragen werden aan de deelnemers van de focusgroep voorgelegd: 1) van welke leerervaringen, opgedaan tijdens het co-assistentschap chirurgie, heeft u het meeste geleerd? 2) wat is de mening van de co-assistent over de gestructureerde onderwijsmomenten, zoals recentelijk ingevoerd in het academisch ziekenhuis? Door alle deelnemers werden spontaan "observatie van klinische activiteiten" en "constructieve feedback" als positieve leerervaring benoemd. Co-assistenten uit het academisch ziekenhuis ervaarden de in het academisch ziekenhuis geïntroduceerde gestructureerde onderwijsmomenten, waarbij observatie en feedback een belangrijke rol speelt, als positief. Alle deelnemers van de focusgroep waren echter van mening dat observatie van klinische activiteiten, gevolgd door feedback, nog steeds een weinig voorkomende gebeurtenis is. Co-assistenten hadden duidelijke ideeën over goede doceerkwaliteiten. Volgens de co-assistenten werd "leren" gestimuleerd door hen actief te betrekken bij klinische werkzaamheden, door hen vragen te stellen over het patiëntprobleem, door de patiënt als eerste te spreken en te zien, door zich te kunnen voorbereiden op operaties en door deelname aan interactief klein groepsonderwijs. Co-assistenten gaven aan dat zij met name feedback ontvingen van arts-assistenten en in mindere mate van stafleden. Co-assistenten merkten een verschil wat betreft de kwaliteit van de ontvangen feedback tussen beginnende arts-assistenten en ouderejaars arts-assistenten. Beginnende arts-assistenten waren veelal niet in staat om constructieve en informatieve feedback te geven aan de co-assistent. Vanwege hun eigen veelal drukke klinische werkzaamheden besteedden beginnende arts-assistenten nauwelijks aandacht aan de klinische werkzaamheden van de co-assistent. Niet alle co-assistenten ervaarden hun leeromgeving als positief. Zo gaven sommige co-assistenten aan dat zij geen vragen durfden te stellen aan hun docenten, omdat zij vreesden voor "dom" te worden gehouden.Co-assistenten waren van mening dat het noodzakelijk is eerder verworven kennis wat betreft het vakgebied van de chirurgie op te frissen, om zo een optimaal leerrendement tijdens het co-assistentschap te kunnen nastreven. Co-assistenten gaven echter aan pas te gaan studeren kort voor het af te leggen afsluitende artsexamen. Wegens drukke en vaak lange werkdagen ontbrak hen de tijd en energie om eerder te starten met het opfrissen van eerdere opgedane kennis.

In deze studie bleek het mogelijk aan te geven welke leerervaringen een positieve bijdrage leveren aan het leren van co-assistenten tijdens hun co-schap. In algemene zin werden de in het co-assistentschap van het academisch ziekenhuis doorgevoerde onderwijsveranderingen positief gewaardeerd. De verkregen resultaten van deze studie geven richting aan vervolgonderzoek, ten einde de kwaliteit van de leeromgeving van een co-assistentschap te verbeteren.

**Hoofdstuk 5** richtte zich op de vraag of de effectiviteit van leren tijdens een co-schap kan worden vergroot door te interveniëren in de docentengroep. Alvorens deze vraag te kunnen beantwoorden is het noodzakelijk om een valide en betrouwbaar meetinstrument te ontwikkelen, ten einde onderwijskwaliteiten van individuele docenten als mede van docentengroepen te kunnen vaststellen. Uitkomsten kunnen worden gebruikt voor individuele feedback en voor ondersteuning- en verbetertrajecten voor docenten. In Hoofdstuk 5 werd de ontwikkeling van een dergelijk instrument beschreven. In deze studie werd gebruik gemaakt van een Nederlandse versie van The Clinical Teaching Effectiveness Instrument (CTEI). Dit instrument werd oorspronkelijk door Copeland en Hewson ontwikkeld, gebruikt en gevalideerd in een klinisch onderwijsprogramma in de Verenigde Staten van Amerika. Het instrument bestaat uit een scorelijst van 15 stellingen. De 15 stellingen zijn samengesteld op basis van uit de literatuur bekende gegevens over kwaliteit en effectiviteit van doceren in een klinische leeromgeving. In hoeverre men het eens is met de gegeven stelling kan worden aangegeven op een schaal van 1 (volledig oneens) tot vijf (volledig eens).
De CTEI werd vertaald in het Nederlands en door een professioneel vertaler terugvertaald in het Engels om geen nuances verloren te laten gaan. In deze studie werden twee onderzoeksvragen geformuleerd: 1) hoeveel scorelijsten, ingevuld door verschillende co-assistenten, zijn nodig om betrouwbaar uitspraken te kunnen doen over de doceerkwaliteiten van een individuele docent? 2) Hoeveel scorelijsten en hoeveel docenten zijn nodig om betrouwbaar uitspraken te kunnen doen over de gemiddelde doceerkwaliteiten van een groep docenten? Aan co-assistenten chirurgie werd gevraagd om anoniem eens per week twee CTEI scorelijsten in te vullen. In de ene scorelijst werd gevraagd te reflecteren op een ervaren onderwijsmoment met een arts-assistent, voor de andere scorelijst werd een reflectie gevraagd op een onderwijsmoment met een staflid. De keuze van het onderwijsmoment waarop werd gereflecteerd, bijvoorbeeld een status nabespreken, werd overgelaten aan de co-assistent. De resultaten van de ingevulde scorelijsten lieten geen significante verschillen zien tussen stafleden en arts-assistenten. De grootste bron van variantie kon worden toegeschreven aan de beoordelaarvariantie. Om met een mate van betrouwbaarheid van $\geq 0.80$ uitspraken te kunnen doen over de kwaliteit en effectiviteit van doceren van de individuele docent waren zeven of meer ingevulde scorelijsten noodzakelijk. Voor een groep docenten werd een betrouwbaarheid van $\geq 0.80$ bereikt als 1 beoordelaar tenminste 15 verschillende docenten eenmalig beoordeelde. Een zelfde betrouwbaarheid kon worden bereikt als 1 beoordelaar van een groep van 10 docenten van elke docent 2 scorelijsten invulde. Deze studie toonde aan dat met een vertaalde versie van de

CTEI in een Europese setting eveneens betrouwbare uitspraken kunnen worden gedaan over doceerkwaliteiten van individuele docenten in klinische stages. Met een, voor de praktijk goed haalbare steekproefgrootte (N=10), kon eveneens een betrouwbaarheid van ≥ 0.80 worden bereikt voor interpretaties van scores op het niveau van docentengroepen.

In **hoofdstuk 6** werd het effect van feedback en het effect van een, op onderwijs gerichte, training voor arts-assistenten op de kwaliteit van hun doceren onderzocht. Aan co-assisenten werd gevraagd om een onderwijsmoment met een arts-assistent te beoordelen middels het invullen van een scorelijst, een Nederlandse afgeleide van de Clinical Teaching Effectiveness Instrument (CTEI). De CTEI, zoals beschreven in hoofdstuk 5, blijkt een betrouwbaar instrument te zijn om de doceerkwaliteit van individuele docenten te meten in een Nederlands co-assistentschap. Vijftien arts-assistenten namen deel aan een tweedaagse scholing "Train the trainers". Kwantitatieve data werden verkregen door, voorafgaand aan de training, van elke deelnemende arts-assistent CTEI scores te verzamelen.Deze voormetingen werden vertrouwelijk met alle beoogde deelnemers besproken. Na afloop van de training werden opnieuw scorelijsten van de deelnemers verzameld (nameting). Scorelijsten van arts-assistenten die niet hadden deelgenomen aan de tweedaagse scholing, fungeerden als controle. Kwalitatieve data werden verkregen door na afloop met elke deelnemer een semi-gestructureerd interview te voeren. Tussen de controle groep, de voormeting en de nameting konden geen significante verschillen worden aangetoond. Schattingen van de zogenaamde 'effect size' (ES) werden berekend om een indruk te krijgen van de mate van effectiviteit van de geboden training. ES ≈ 0.80 suggereert een grote mate van effect van de interventie, ES ≈ 0.50 een redelijk effect en ES ≈ 0.20 een verwaarloosbaar klein effect. Tussen de controle groep en de nameting werd een ES gevonden van 0.76. De verzamelde kwalitatieve data suggereerden een positief effect van de onderwijstraining ope doceerkwaliteiten van arts-assistenten.Het aantal arts-assistenten dat in deze studie kon worden geïncludeerd was beperkt. De resultaten toonden aan dat een tweedaagse training voor arts-assistenten een onvoldoende basis biedt om significant aantoonbare verbetering van doceerkwaliteiten te bewerkstelligen. De groep geïncludeerde arts-assistenten was te klein om statistisch significante verschillen aan te tonen. De Estimations of Effect Size en de verzamelde kwalitatieve data suggereerden evenwel een positief effect. Aanvullende, korte workshops, waarin onderwerpen worden besproken welke aansluiten bij de ervaringen van de deelnemers, werden aangeraden ten einde de doceerkwaliteit van arts-assistenten te verbeteren.

**In hoofdstuk 7** werden de resultaten van de studies, zoals beschreven in de hoofdstukken 2-6, besproken in relatie tot de bestaande literatuur op het gebied van medisch onderwijs. Aanbevelingen voor verder onderzoek werden gegeven.

# DANKWOORD

# *Dankwoord*

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